THE AMERICAN GAS LIGHT JOURNAL

REDMAN&KENNY,N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXV.—No. 19. Whole No. 1,378. | NEW YORK, MONDAY, NOVEMBER 4, 1901. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $5 (£1—25 francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Bound Volume, Proceedings New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF THE SECRETARY,
NEW BEDFORD, MASS., Oct. 26, 1901.

A limited number of copies of the "Proceedings" of the New England Association of Gas Engineers, for the years 1900 and 1901, remain, and single copies can be obtained on application to the Secretary, who will mail them on receipt of $2. This volume contains several papers and the discussions thereon, and are of especial value for reference. The "Proceedings" of prior years will be published later, and the volumes will be of great value for any gas man's library.

N. W. GIFFORD, Secretary.

BRIEFLY TOLD.

PRACTICAL PROGRESS IN THE SUBSCRIPTION TO THE LIBRARY AND INFORMATION FUND OF THE WESTERN GAS ASSOCIATION.—Our issue for September 30th last gave the details of the plan prepared by the Committee of the Western Gas Association in reference to the matters named in the caption to this mention. Presuming that the gas men have not forgotten what was then announced, it is our satisfaction to say that many subscriptions have been received and that the success of the scheme is in no sense doubtful. Nevertheless, so that the work may be commenced at the earliest possible moment, companies and individuals interested in the movement (and none connected with the gas industry can be negleetful of its benefits) should make their subscriptions at once to Secretary James W. Dunbar, at the office of the Association in New Albany, Ind. He will be ready to furnish any and all information about the fund and its purposes that anyone may care to ask. It has been determined that if sufficient subscriptions come to hand, the first indexing of gas literature will be put out in the card index form, each subscriber receiving bulletins from time to time, as the work progresses, at intervals of from 30 to 60 days. The bulletins will include, besides the indexing, a note as to the length of the article catalogued, with its characteristics, as to completeness, and so on. Mr. F. H. Shelton has been appointed by the Committee to have supervision with Mr. Frederick Egner, who is to attend to the details of the indexing, over its planning and carrying out. It is arranged that the subscription is to extend for a period of 3 years, but those who prefer to give a lump sum, provided the same is not less than the minimum sum for a 3 years' subscription on maximum account, may do so. As said before, Secretary Dunbar stands ready to give any information respecting the fund and its object that anyone may see fit to ask. The list of subscribers to October 28th is appended:

Subscriber.	Per Annum.
AMERICAN GAS LIGHT JOURNAL, N. Y.	$40
Burlington Coal Company	10
Cincinnati (O.) Gas and Electric Company	50
Detroit (Mich.) Stove Works	50[1]

1. The respective subscriptions of the Detroit Stove Works and the Mueller Mfg. Co. are lump sums, and not per annum.

LIBRARY OF CONGRESS NOV 4 1901 SMITHSONIAN DEPOSIT

Subscriber.	Per Annum.
Doty, Paul, Detroit	$10
Dunbar, J. W., New Albany, Ind	10
Fort Madison (Ia.) Gas Company	10
Kentucky Heating Company, Louisville, Ky	10
Keystone Meter Company, Royersford, Pa	10
Lansing (Mich.) Gas Company	20
Lima (O.) Gas Company	10
Louisville (Ky.) Gas Company	50
Lynchburg (Va.) Gas Company	10
Michigan City (Ind.) Gas Company	10
Mueller Mfg. Company, Decatur, Ills	25[1]
Nettleton, C. H., Derby, Conn	30
New Orleans Lighting Company, New Orleans, La	50
Ogden Gas Company, Chicago, Ills	50
Peoples Power Company, Moline, Ills	20
Portsmouth (O.) Gas Company	10
Philadelphia Suburban Gas Company, Darby, Pa	20
Roots, P. H. & F. M., Connersville, Ind	10
San Antonio (Texas) Gas Company	10
Shelton, F. H., Philadelphia, Pa	10
Waterloo (Iowa) Gas and Electric Company	10
Windsor (Can) Gas Company	10

With this outlined start there can be no doubt as to the outcome; but it is well to remember that those who give quickly are the ones whose force puts cavil at an end. Secretary Dunbar, even though we so remarked once, perhaps twice, before in this telling, will furnish to any inquirer any information needed in the premises.

NOTES.—Mr. R. D. Wirt, whose excellent work as Superintendent of the Independence (Mo) Gas and Coke Company covers a period of 20 years, has decided to retire from its service.——Among recent contracts awarded to the United Gas Improvement Company is one for the construction of the new plant at Mount Carmel, Pa. The generating apparatus will, of course, be of the contracting Company's well-known standard double-superheater Lowe type, and the per diem capacity of the set is put at 125,000 cubic feet. Our informant adds that "The rest of the plant will be of character and kind to make a thoroughly modern works."——The Paterson and Passaic (N. J.) Gas and Electric Company has reduced its selling rate to $1.20 per 1,000 cubic feet gross, with a concession of 10 cents per 1,000 for prompt payment. Col. Rogers and Mr. Williams seem to be working along the same o'd sensible lines despite the changes in organization and ownership of the gas properties of Paterson and Passaic that they have witnessed.——The readjustment of the affairs of the Santa Fe (New Mexico) Water and Light Company has been finally accomplished.——Mr. Charles Marsh, formerly interested in the firm of Battin & Dongan, of Philadelphia (noted builders of gas works in their time), died at his home in Newark, N.J., the morning of October 26th. He was in his 71st year.

Cyanide of Potassium from Bisulphide of Carbon.

Engineering recently asserted that the economy of cyanide recovery processes in coal gas manufacture is threatened by a new process depending on the use for the same purpose of carbon bisulphide. Potassium cyanide, it is stated, is now made by a process covered by the patent of Raschen, Davidson and Brock, of which the following is a brief account: Carbon bisulphide, ammonia, and hydrate of lime are located together in a closed vessel, and the solution of calcium sulphocyanide thus obtained is decomposed by carbonic acid and potassium carbonate or sulphate. The dry potassium sulpho-cyanide is then mixed with quicklime and carbonaceous matter, and heated with agitation; and, after lixiviation, it yields potassium cyanide.

This process is said to be now in use on the large scale by one of our most important chemical corporations; and to it can be traced the renewed activity in the manufacture of bisulphide of carbon which is noticeable at the present time. The chief difficulty of this trade, however, lies in the transport of such an objectionable fluid, which is subject to many restrictions. The price of potassium cyanide has fallen rapidly of late years, notwithstanding the permanence of the use of the substance for gold recovery. It has ceased, therefore, to interest makers so much as it formerly did. The notable point of the present situation is that established makers of carbon bisulphide will not gain anything by the success of the new cyanide process, because large consumers of cyanide will find it more convenient to make their own. In the waste regions where gold is mined, this manufacture gives the users less trouble than the importation of the compound.

[1] The respective subscriptions of the Detroit Stove Works and the Mueller Mfg. Co. are lump sums, and not per annum.

[LIMITED ABSTRACT.]

PROCEEDINGS TWENTY-NINTH ANNUAL MEETING AMERICAN GAS LIGHT ASSOCIATION.

HELD AT STEINERT HALL, BOSTON, MASS., OCTOBER 16 TO 18, 1901.

FIRST DAY—WEDNESDAY, OCT. 16—MORNING SESSION.

The Association was called to order by the President (Mr. Edward G. Pratt, of Des Moines, Ia.), at 10 A.M.

ROLL CALL.

The following members were in attendance:

Honorary.

Barker, F. E., Boston, Mass.

Active.

Addicks, W. R., Boston, Mass.	Leach, H. B., Taunton, Mass.
Africa, G., Manchester, N. H.	Learned, C. A., Meriden, Conn.
Arthur, F. M., Philadelphia, Pa.	Learned, W. A., Newton, Mass.
Baehr, W. A., Denver, Col.	Leonard, C. F., Fall River, Mass.
Barrett, W. E., Ardmore, Pa.	Lillie, L., Philadelphia, Pa.
Battin, H. S., Philadelphia, Pa.	Littlehales, T., Syracuse, N. Y.
Beal, W. R., New York, N. Y.	Lynn, J. T., Detroit, Mich.
Bell, E. W., St. Louis, Mo.	McDonald, W., Albany, N. Y.
Blinks, W. M., Michigan City, Ind.	McIlhenny, J. D., Philadelphia, Pa.
Blodget, C. W., Providence, R. I.	McKay, W. E., Dorchester, Mass.
Brown, E. C., New York, N. Y.	Mann, H. E., Cleveland, O.
Brundrett, E. L., Philadelphia, Pa.	Max, W. J., Middletown, N. Y.
Buck, D., Jr., Phœnixville, Pa.	Mayers, J. A., New York, N. Y.
Buck, H. M., Waukesha, Wis.	Merrifield, L. I., Toronto, Can.
Buckman, J., Philadelphia, Pa.	Miller, A. S., New York, N. Y.
Butterworth, I., Denver, Col.	Miller, C., Chicago, Ills.
Callanan, J. M., Chester, Pa.	Miller, W. A., Cincinnati, O.
Capelle, G. S., Wilmington, Del.	Mitchell, K. M., St. Joseph, Mo.
Cathels, E., Hamilton, Ont.	Morrell, E. E., Oak Park, Ills.
Clark, W., Philadelphia, Pa.	Morris, W. C., Long Island City, N. Y.
Clarke, G. S., Kansas City, Mo.	Morrison, H. K., Concord, N. H.
Clary, E. D., Burlington, Iowa.	Morton, F. N., Hoboken, N. J.
Coates, J. R., Ottawa, Ont.	Moses, F. D., Trenton, N. J.
Coffin, J. A., Gloucester, Mass.	Nettleton, C. H., Derby, Conn.
Coggshall, H. F., Fitchburg, Mass.	Norris, R., Philadelphia, Pa.
Cooke, A. S., New York, N. Y.	Norton, W. F., Nashua, N. H.
Cooper, W. H., Amsterdam, N. Y.	Nute, J. E., Fall River, Mass.
Cosgrove, W. L., Atlanta, Ga.	Nutting, C. H., Chicopee, Mass.
Cowdery, E. G., Milwaukee, Wis.	Page, C. H., Jr., Philadelphia, Pa.
Coyle, P., Charlestown, Mass.	Paullins, W. C., Col. Springs, Col.
Cressler, A. D., Fort Wayne, Ind.	Pearson, W. H., Toronto, Ont.
Curley, T., Wilmington, Del.	Pratt, E. G., Des Moines, Ia.
Curtis, S. P., Philadelphia, Pa.	Prichard, C. F., Lynn, Mass.
Daly, D. R., Jersey City, N. J.	Quinn, A. K., Newport, R. I.
Daniels, J. M., Columbia, S. C.	Ramsdell, G. G., Philadelphia, Pa.
Davis, F. J., Boston, Mass.	Randolph, W. W., New York, N. Y.
Dell, J., St. Louis, Mo.	Rice, H. L., Norfolk, Va.
Dickey, C. H., Baltimore, Md.	Richardson, F. S., N. Adams, Mass.
Donahue, E. J., Philadelphia, Pa.	Riselay, W. S., Buffalo, N. Y.
Dunbar, C. H., Elgin, Ills.	Roberts, G. J., Philadelphia, Pa.
Dutton, L. R., Wyncote, Pa.	Robison, C. D., Geneva, N. Y.
Dutton, R. H., Hanover, Pa.	Ross, A., St. Louis, Mo.
Earnshaw, E. H., Philadelphia, Pa.	Rossmann, G. M., Keene, N. H.
Egner, F., Norfolk, Va.	Rowland, W. L., Philadelphia, Pa.
Ferrier, J., Columbus, Ga.	Russell, D. R., St. Louis, Mo.
Fitz, R. F., Elgin, Ills.	Sabbaton, F. A., Glens Falls, N. Y.
Flemming, D. D., Jersey City, N. J.	Searle, R. M., Mount Vernon, N. Y.
Floyd, F. W., New York, N. Y.	Seaverns, F., New York, N. Y.
Forstall, A. E., New York, N. Y.	Shattuck, J. D., Darby, Pa.
Forstall, W., Philadelphia, Pa.	Shelton, F. H., Philadelphia, Pa.
Fowler, S. J., Boston, Mass.	Sherman, F. C., New Haven, Conn.
Frueauff, F. W., Denver, Col.	Slade, R. E., Lockport, N. Y.
Gates, F. W., Hamilton, Ont., Can.	Slater, A. B., Providence, R. I.
Geggie, D. H., Quebec, Can.	Slater, A. B., Jr., Boston, Mass.
Gerould, C. L., Galesburg, Ills.	Slafer, H. C., Boston, Mass.
Gifford, N. W., New Bedford, Mass.	Smart, F. R., Jr., York, Pa.
Glasgow, A. G., London, S. W., Eng.	Snow, W. H., Holyoke, Mass.
Golden, J. W., Savannah, Ga.	Spangenberg, B. H., Phila., Pa.
Graf, C. H., Hackensack, N. J.	Spaulding, C. F., Waltham, Mass.
Greenough, M. S., Cleveland, O.	Spinning, W. V., Peru, Ind.
Gribbel, J., Philadelphia, Pa.	Sprague, L. D., Johnstown, N. Y.
Guldlin, O. N., Fort Wayne, Ind.	Stillwell, B. W., Yonkers, N. Y.
Hadden, J. M., Poughkeepsie, N. Y.	Strong, C. D., Long Branch, N. J.
Harbison, J. P., Hartford, Conn.	Stroud, M. W., Philadelphia, Pa.
Harper, G. H., Altoona, Pa.	Thwing, O. O., St. Louis, Mo.
Holmes, R. E., Winsted, Conn.	Tobey, F., Jr., Kingston, N. Y.
Holzer, E. G., Easton, Pa.	Tuttle, W. B., Long Branch, N. J.
Horton, T. O., Stapleton, N. Y.	Waldo, C. S., Boston, Mass.
Humphreys, A. C., New York, N. Y.	Walker, E. M., Hyde Park, Mass.
Humphreys, C. J. R., Lawrence, Mass.	Walters, B. S., Philadelphia, Pa.
Jenkins, E. H., San Antonio, Tex.	Warmington, D. R., Cleveland, O.
Jourdan, J. H., Brooklyn, N. Y.	Weber, O. B., New York, N. Y.
Kellogg, L. L., Sioux City, Iowa.	Westcott, J. T., London, S. W., Eng.
Keppelman, J. H., Reading, Pa.	Wharton, W. S., Whatcom, Wash.
Klumpp, J. B., Omaha, Neb.	Wheeler, F. B., Binghamton, N. Y.
Knowles, W. P., Richmond, Va.	Whipple, H. S., Rockford, Ills.
Lamson, C. D., Worcester, Mass.	White, C. E., Wakefield, Mass.

White, W. H., New York, N. Y.
Wilcox, J. F., Cleveland, O.
Williams, E. H., Waterbury, Conn.
Williams, L. S., Harrisburg, Pa.
Williams, W. L., Paterson, N. J.
Williamson, J., Chicago, Ills.
Witherby, E. E., New York, N. Y.
Wood, S., Philadelphia, Pa.
Wood, W. A., Boston, Mass.
Woodward, R., Philadelphia, Pa.
Yorke, E. H., Portland, Me.
Young, P. S., Jersey City, N. J.
Young, P., Detroit, Mich.
Zeek, C. F., Pensacola, Fla.

Associate.

Allen, W. S., New Bedford, Mass.
Atwater, C. G., New York, N. Y.
Cartwright, H. R., Phila., Pa.
Coburn, C. M., Chelsea, Mass.
Coleman, H. W., Philadelphia, Pa.
Collins, D. J., Philadelphia, Pa.
Crane, W. M., New York, N. Y.
Curley, E. J., Wilmington, Del.
Dickey, E. S., Baltimore, Md.
Eaton, A. B., Chicago, Ills.
Fisk, J. T., Concord, N. H.
Graves, G. W., Rochester, N. Y.
Guenther, C. M., Philadelphia, Pa.
Harper, H. D., Chicago, Ills.
Hayward, S. F., New York, N. Y.
Higgins, C. M., New York, N. Y.
Hinman, C. W., Boston, Mass.
Jacobs, C. H., Detroit, Mich.
Luqueer, R. O., New York, N. Y.
McDonald, D., Albany, N. Y.
Mansur, J. H., Royersford, Pa.
Mueller, R., Decatur, Ills.
Norton, A. E., Boston, Mass.
Norton, H. A., Boston, Mass.
Pearson, J. A., Philadelphia, Pa.
Persons, F. R., Toledo, O.
Prendergast, D. J., New York, N. Y.
Roper, G. D., Rockford, Ills.
Steward, R. B., Chattanooga, Tenn.
Tolman, W. N., Philadelphia, Pa.
Van Wie, E. G., Detroit, Mich.
Wells, F. K., Chicago, Ills.
Wharton, H., Philadelphia, Pa.

The reading of the minutes of the last meeting having been dispensed with, the Secretary read the following report from the Council in the matter of

APPLICATIONS FOR AND CHANGES IN MEMBERSHIP.

To the American Gas Light Association—Gentlemen: Your Council has approved the following applications for membership, and submit them to you with the recommendation that they receive favorable action.

Active.

Allen, W. H., Newark, N. J.
Allyn, H. A., E. Cambridge, Mass.
Apperson, R. D., Lynchburg, Va.
Blake, S. N., Elmira, N. Y.
Brown, W. O., Phillipsburg, N. J.
Burrage, C. D., Boston, Mass.
Butterworth, C. W., St. Albans, Vt.
Case, W. E., Auburn, N. Y.
Chandler, F. E., Medford, Mass.
Childs, A. E., Boston, Mass.
Clabaugh, G. W., Omaha, Neb.
Clark, T. H., Spencer, Mass.
Crafts, H. C., Northampton, Mass.
Curran, G. W., Yonkers, N. Y.
Dawson, G. H., Binghamton, N.Y.
Dole, C. E., Bangor, Me.
Dunn, F. S., Albany, N. Y.
Dusenberry, J. P., Newark, N. J.
Eysenbach, E. E., Columbus, O.
Forbes, C., London, Can.
Ganser, H. H., Norristown, Pa.
Goodnow, G. F., Waukegan, Ills.
Gould, J. A., Boston, Mass.
Hilieke, A. F., Everett, Mass.
Knight, J. J., Kalamazoo, Mich.
Light, G., Dayton, O.
Linton, S. E., Jr., Sag Harbor, N.Y.
Macmun, G.F., Marlborough, Mass.
Motley, G. S., Lowell, Mass.
Old, G., St. Augustine, Fla.
Pollitt, L. I., Pine Bluff, Ark.
Powers, E. T., Lincoln, Neb.
Ruggles, C. S. J., Gardner, Mass.
Sargent, F. H., Lawrence, Mass.
Secord, W. L., New Rochelle, N.Y.
Seymour, W.W., Tacoma, Wash.
Stratton, F. A., Mt. Vernon, N. Y.
Taussig, J. H., Newark, N.J.
Taylor, J. D., Jr., Pueblo, Col.
Thompson, F.deV., Springfield, Mass.
Tippy, B. O., Detroit, Mich.
Tull, L. P. F., N. Y. City.
Walker, R., Bay City, Mich.
Waring, G. H., Jr., Savannah, Ga.
Williams, H G., Mt. Nernon, N.Y.
Wood, T. B., Jersey City, N. J.
Young, R. R., Passaic, N. J.
Young, R., Jr., Atlanta, Ga.

Associate.

Baldwin, C. H., Boston, Mass.
Barrows, G.S., Gloucester City, N.J.
Bassett, F. A., Bridgeport, Conn.
Bernstein, S., New York City.
Burchard, L. S., New York City.
Chaney, F. V., Boston, Mass.
Dickel, W. L., Somerville, N. J.
Dods, J. C., St. Louis, Mo.
Hunter, H.W., Baltimore, Md.
Leakey, N. G., Detroit, Mich.
Lippincott, W. M., New York City.
McIlravy, W.N., New York City.
Marsh, D., New York City.
Mills, W. A., Port Chester, N. Y.
Nichols, C. B., Philadelphia, Pa.
Palmer, G. Q., New York City.
Potter, T. J., Cleveland, O.
Roberts, C. V., Philadelphia, Pa.
Rodgers, E. H., Philadelphia, Pa.
Stroh, G., Detroit, Mich.
Terhune, C. F., New York City.
Webber, W., New York City.
Welch, J. S., Philadelphia, Pa.
Wickham, L., St. Louis, Mo.
Wilkinson, C. T., Brockville, Ont.

Transfers from Associate to Active.

Collins, D. J., Philadelphia, Pa.
Mansur, J. H., Royersford, Pa.
Roper, G. D., Rockford, Ills.

Respectfully submitted for the Council,
E. G. PRATT, President.
ALFRED E. FORSTALL, Secretary.

ELECTION OF NEW MEMBERS.

On motion, the report of the Council was accepted and the recommendations as to the changes in the membership list were adopted.

REPORT OF THE COUNCIL.

The Secretary then read the following report from the Council:

To the American Gas Light Association—Gentlemen: Your Council have the honor to make their annual report, as follows:

A separate report upon applications for membership recommends the election of 73 applicants.

They recommend the election to honorary membership of Dr. H. Bunte and of Herr W. von Oechelhaeuser. Dr. Bunte has probably done as much work in chemical and scientific investigation into the processes of gas manufacture as any other one man connected with the industry; and Herr von Oechelhaeuser, as Manager of the German Continental Gas Company, has been foremost in the ranks of German gas engineers.

The resignations of 7 active and 3 associate members have been received and accepted during the year.

The following list of papers has been approved to be read at this meeting:

"What is the Business of a Gas Company?" by Mr. F. D. Moses, Trenton, N. J.

"Tar and Water from Water Gas," by Mr. W. E. McKay, Boston, Mass.

"Further Notes on Retort House Practice," by Mr. E. H. Earnshaw, Philadelphia, Pa.

"Retort Ovens as Producers of Illuminating Gas," by Mr. T. Littlehales, Syracuse, N. Y.

"The Fuel Value of Residuals," by Mr. C. F. Prichard, Lynn, Mass.

Also the following short topics:

"Bagging for Live Gas Mains," by Mr. Walton Forstall; and a discussion of the differences between two sets of standards for cast iron pipes and fittings.

We regret that the efforts made to arrange for a lecture to be delivered before the Association during the meeting have not been successful.

In accordance with the instructions of the Association, as voted at the last meeting, the Secretary sent to all the active members of the Association letters asking their opinion as to the suitability of the cast iron pipes and fitting standards of the Association, and their willingness to insist on being furnished with pipe and fittings conforming to the standard. Out of a total of 461 members addressed he has received replies from 99, of whom 59 approved of, 6 did not approve of, and 34 partially approved, were doubtful about, or did not care to express their views as to the standards. In view of the small number of members heard from in approval, he exercised the discretion given him as to carrying out the remainder of the instructions contained in the resolutions mentioned above, and did not write the pipe manufacturers. In view of these facts it was thought well to again bring the matter before the Association; and it was referred to the Research Committee with the request that they report on it at this meeting of the Association.

At the last meeting of the Association the President, Mr. George G. Ramsdell, was authorized to appoint a committee of three to consider the question of a system of uniform accounts for gas companies. This committee was appointed as follows: A. C. Humphreys, Chairman; Lewis Lillie, A. P. Lathrop. It will make a report at this meeting.

Respectfully submitted,
E. G PRATT, President.
Boston, Oct. 16, 1901. A. E. FORSTALL, Secretary.

The report was received and placed on file, and the recommendation as to the election of Dr. H. Bunte and Herr W. von Oechelhaeuser to honorary membership was adopted.

REPORT OF TREASURER.

As Treasurer, Mr. Forstall reported that the total receipts for the year amounted to $4,322.87, that the expenditures had been $3,261.81, and that the balance in hand was $1,061.06. The credit to "Sales of Proceedings" was $197.65.

REPORT OF SECRETARY.

As Secretary, Mr. Forstall reported that the membership roll, for the year ended September 30, 1901, carried a total of 541 names. Of these 10 were honorary, 452 were active, and 79 were associate.

The reports were received and filed.

REPORT OF TRUSTEES OF GAS EDUCATIONAL FUND.

The Secretary read the following report of the Trustees of the Gas Educational Fund, which was received and ordered spread upon the minutes:

To the American Gas Light Association and Subscribers: The Trustees appointed at the Twenty-Sixth Annual Meeting of the American Gas Light Association, held October 19th, 1898, to administer the educational fund formed by your subscriptions, submit the following report as to the work done, from October 1, 1900, to September 30, 1901.

The main object for which the fund was raised—that of encouraging and guiding the efforts of those employees of gas companies who, lack-

ing the advantages of an extended education, are anxious to acquire knowledge that will be of service to them in their work, has been provided for as before by the Correspondence Class working under the direction of the Secretary. This Class now contains three sections, known as the second, third and fourth sections; the second section being in its third year, the third in its second year, and the fourth in its first year of work. Each of these sections receives its own set of questions which are made to differ as much as possible from those sent to the other sections, although each section covers the same ground during its three years' course as that covered by preceding sections. The second section will complete its work at the end of this year, and a fifth section will be formed at the same time from new applicants for admission to the Class.

In September, 1900, a rule was made that in the future no graduates of a university or technical college would be admitted to full membership in the Class, but that any such applicants could, upon payment of an annual fee of $5, be admitted to a special section, the members of which would receive the questions and answers as issued, but would not be entitled to the individual attention given to the regular members. The object of this rule is to make it certain that the benefits of the work will accrue chiefly to those who, having had the fewest educational advantages, are, therefore, the most in need of the assistance that is given by the work of the Class.

The other rules governing admission to, and continuance of, membership in the Class are as follows:

Eligibility for and Admission to Membership.—Only employees of gas companies are eligible for membership in the Class.

Employees of gas companies, who are not graduates of universities or technical schools nor holders of degrees from colleges, are eligible for membership with the full privileges of the Class without the payment of any fee.

To secure admission to either the regular or special Class a person eligible for membership in such Class must file an application, made according to a prescribed form, copies of which will be furnished by the Secretary upon request, and indorsed by a member of the American Gas Light Association or a subscriber to the fund. In cases where a subscription is made in the name of a company any of the executive officers of such company shall be entitled to indorse applications for membership in the Class.

All applications will be considered by the Secretary, who will admit to the Class applicants whose applications, being in proper form and properly indorsed, show them to be entitled to membership.

When applications are received after the beginning of a Class year, but before the first of June, the applicants will be admitted to membership in that section of the Class which began work upon the first of January immediately preceding the date of their applications, upon condition that they take up and carry on the work in such manner as to complete and send in answers to all the questions sent out to such section during the first year, on or before the first of January next following the receipt of the applications.

Applicants applying for admission after the first of June will not be admitted to the Class before the beginning of the next Class year. The Class year corresponds with the calendar year.

Continuance in Class.—Any member of the Class who fails to send in his answers to any set of questions within the time specified for the receipt of such answers, and does not furnish to the Secretary a good reason for such failure and secure an extension of time in which to send in these answers, or, having secured such an extension of time in which to send in the answers to any set of questions, fails to send in such answers within such extended time, forfeits his membership in, and shall be dropped from, the Class. A member so dropped, if still eligible for membership, may, upon application, re-enter the Class as a member of the next section formed, either at the beginning of the next Class year, or at a point during such year corresponding to that at which his membership ceased in the preceding year.

Members of the Class who send in answers to each set of questions issued within the time originally specified for the receipt of such answers, or within any extended time which may be granted to them, will be continued in the Class for three years, but at the end of this time their membership shall cease by limitation.

Method of Instruction.—A set of 12 questions is sent out each 3 months. Answers to each set of questions are due within 2 months after the date at which it is sent out. In the preparation of their answers the members of the Class are at liberty to use any and all sources of information at their command, except the answers to such questions as have been previously used which are published in the "Proceedings" of the American Gas Light Association. They are also at liberty to consult the Secretary in regard to any question which they do not understand, or upon which they are unable to obtain any satisfactory information by the means at their disposal.

All the answers received from the members of the regular Class are carefully examined by the Secretary, and to each of such members is sent a criticism of his work based upon this examination. Each member receives also a set of the answers prepared by the Trustees to the questions. Both the criticisms upon the answers of the students to any set of questions and the Trustees' answers to these questions are sent out with the next set of questions.

The numbers of members in each section at the beginning of the year, and the changes that have taken place during the year, are shown in detail on the Secretary's report, which is appended. The second section now contains 22 members, the third, 30, and the fourth, 36, making the total membership in the regular Class 88. There are two special students who are receiving the questions and answers with the fourth section.

The other branches of the work as described in previous reports have also been kept up.

The Treasurer's report, which is appended, shows the total amount of subscriptions to date, the available income and expenses for the year, a summary of the cash account, and a statement of the amount of the surplus fund and the securities in which it has been invested.

This surplus fund is made up of portions of subscriptions paid in in advance of the time when they are due, of unexpended balances and of interest received on investments. The proper proportion of the advance subscriptions will, of course, be drawn out each year to meet expenses, but the unexpended balances and the interest will accumulate into a fund which will be available to assist in carrying on the work in case all the present subscriptions are not renewed when they expire.

Respectfully submitted,
Trustees Gas Educational Fund,
Walton Clark, Chairman.
Alfred E. Forstall, Secretary.

The financial showing for the year is a receipt of $4,201.84 and an expenditure of $3,858.13. The surplus fund amounts to $3,443.75.

[To be Continued.]

Tar and Water from Water Gas.

[A paper read by Mr. W. E. McKay, of Boston, Mass., at the 29th Annual Meeting of the American Gas Light Association.]

The tar resulting from the use of crude oil, gas oils, or naphtha, in the manufacture of gas, is conveniently called oil tar; the name suggests a cause and an effect as in the case of coal tar. Papers on the subject presented before this and kindred associations have dealt with many features of the formation, separation, distillation and use of water gas tar, oil gas tar, or, preferably, oil tar. (See Note A, at end of paper.)

The Committee on Research has kept the subject on its permanent list, and this action, with the Secretary's request for additional communications, induces an inquiry as to the reason for the continued attention given to oil tar. Is there an increasing amount of oil tar made? Has oil tar a greater value than formerly? (Note B.) Has the presence of oil tar become a nuisance that requires abatement? Or, are more companies learning that in the value of this by-product there is a larger percentage of the cost of the raw material than there is in the ammonia from gas coal?

Massachusetts is in the van of industrial development, and for 14 years the reports of the Board of Gas Commissioners have included data that will furnish nearly complete information on some of these points. I have tabulated the data so that an inspection of the tables will show the changes in the manufacture of gas and in the sales of residuals, in Massachusetts, during the past 14 years. In all cases the years end on June 30th. To simplify the figures small fractions have been discarded, and in a few insignificant items an incomplete return to the Board has made necessary an unimportant estimate.

Note C, Table 1. This shows, in cubic feet and in percentages, the coal gas, the water gas, and the oil gas made in the State, also the total gas made. Oil gas never equaled ¼ of 1 per cent. of the total. In 1887, 1 per cent. of the total gas made was water gas; in 1897, 64 per cent. of the total was water gas. The water gas made in 1899 is 115 times the water gas made in 1887; but in 1899, the coal gas made is only ⅔ of the coal gas made in 1887.

The enriching oils used—the sources of oil tar—are given in Notes D, E and F, Tables II., III. and IV.. for coal gas, water gas and oil gas, respectively. The oil used per 1,000 cubic feet of gas made is also given. In the case of coal gas, Note D, Table II., the oil tar made has mixed with and probably improved the quality of the product sold as coal tar. It is noticeable that in 1900, the oil used per 1,000 cubic feet of coal gas is about ⅔ the oil used in 1887, although (see Note G, Table V.,) the cannel used in 1887 was 1.9 per cent. of the total coal, while in 1900 the cannel was only ⅛ of 1 per cent. of the total coal. This must denote that the higher candle power is now more generally obtained by mixing with enriched water gas.

In Note E, Table III., for water gas, is also given the percentage of each kind of enricher used. In 1900, the enricher per 1,000 cubic feet is only ⅔ the amount used in 1887. Naphtha has steadily been the chief enricher, crude oil having considerable use until 1897; after 1897 gas oil is increasingly used, and in 1900 gas oil furnishes 55 per cent. of the total oils used, pointing to a larger production of oil tar.

Note F, Table IV., gives the data for oil gas, but the tar from this source is evidently a small fraction of the total, though not one to be neglected by makers of oil gas.

Note G, Table V.—Coal carbonized, and coal gas made. The gas per ton of coal has decreased as the enriching oil has decreased. The estimate of 12.5 gallons tar sold per ton of coal is perhaps too high; but even at this figure, 1900 shows nearly 2.3 times as much received per gallon as in 1887. Coal tar and pitch were put on the free list October, 1890 (corresponding to year 1891 in tables), before that date the duty was ad valorem, 10 per cent. on tar, 20 per cent. on pitch.

Note H, Table VI.—Total income from sales of residuals, and sales of coke, tar and ammonia; also, the percentages for each residual.

Note J, Table VII.—For coal gas, income from sale of residuals per ton of total coal used. Here, ammonia is an entirely satisfactory basis for comparison, as this cannot be converted within the works into fuel, like coke or tar, and the return represents accurately all the value received from this by-product.

Note K, Table VIII., gives returns from sales of residuals for one company, making water gas only, and shows the oils used, the tar burned, and the net return from tar sold per 1,000 cubic feet of gas made. With a due allowance for value of tar burned, the total value of the oil tar made per 1,000 for 1900, is higher than the average return (for the State) from ammonia sold per 1,000 cubic feet of coal gas made.

If manufacture in Massachusetts is fairly representative of the whole country, these tables demonstrate that oil tar is being made in increasing quantities, and that it is a marketable product, inviting the profitable attention of gas makers. (Note L.)

How much oil tar is made per 1,000 cubic feet of water gas? Some answers to this question are given in Note M. The fractional distillation of the oil will give some knowledge of the tar that can be expected. In Note N are given typical distillations that were exhibited at the Gas Exposition in Madison Square Garden, New York, 1897. With Lowe double superheater apparatus I have found the yield of tar for the corresponding oils to be:

With crude oil,	maximum.....	15.1 per cent.
" "	minimum.....	11.8 "
" "	average.....	13.5 "
With gas oil,	maximum.....	18.3 "
" "	minimum	12.3 "
" "	average.....	15.6 "
With naphtha,	maximum.....	3.5 "
" "	minimum.....	1.7 "
" "	average.....	2.6 "

These percentages refer to tar almost entirely free from water, and are determined by the use of large quantities of oils during long periods of time.

The system we have developed for separating the tar from the gas and the water from the tar is simple and has been in part described at several meetings of the New England and other Associations. At the wash box the seal is carried as light as possible. The water supply for the wash box is drawn from the tar well that receives the water and tar flowing from the condensers and scrubbers. The suction of the circulating pump is at a level that returns mostly water to the wash box, the tar emulsion flowing slowly on into other sections of the tar wells. The water enters the wash box at 160° to 170°, and the overflow from the wash box (returning to the same tar well from which it was drawn) is 170° to 180°. The gas leaving the wash box is saturated with aqueous and tarry vapors at 186° to 192°. The gas is cooled by water in tubular condensers, and by air outside the dry scrubbers; it meets no fresh supply of water until it enters the station meter. The gas is cooled to between 50° and 70° as it enters the purifiers; the tar and watar that are then mechanically carried by the gas are absorbed by layers of shavings in the usual way.[1]

No auxiliary heat is furnished in the tar wells, where the onward flow is only equal to the tar made plus the excess of steam used in the Lowe apparatus; and so the total flow is 1.5 to 3 gallons per 1,000 cubic feet of gas. All of this surplus water and the tar are pumped once each day into a tank, where separation is effected by heat from a steam coil near (but not on) the bottom of the tank. The usual amount of steam heat necessary for this work is represented by a fuel charge of ¼ pound coal per 1,000 cubic feet of gas made, but frequently twice this amount is used. We have several times handled the oil tar from the Wilkinson apparatus, and this we have separated from an emulsion of 66 per cent. water, at a cost of ⅛ of a cent per gallon of tar recovered.

The tank contents are heated to 212°, and after the necessary interval the steam heat is shut off and the tank contents cooled to 150°. The tar is then run out and pumped to storage; the water is run out into a filter box, where small, screened generator cleanings remove the traces of tar that are yet held in the water. The tar wells and the filter box were designed by Captain Walter R. Addicks and give excellent service. In the filter box 1 ton of screened generator cleanings will clear the overflow from 10 million cubic feet of gas, and will then be a good boiler fuel. The water leaving the filter box is colored with ash (from the generator fuel) holding a little lampblack. This ash and lampblack are very light, and are the troublesome components of the residuals. The ash is of great volume for small weight, and both ash and lampblack are nuclei for naphthaline deposits as they travel with the gas through the apparatus. (Note O.)

The lampblack, especially, is the general cause of any occasional retardation in the separation of the tar emulsion. In fact, I think that this small amount of free carbon should receive the blame indiscriminately laid upon oil-tar emulsion. In coal gas manufacture, with zero seal in the hydraulic main, the gas temperature is relatively low, much of the carbon remains in the retorts or standpipes, and the tar absorbs the flocculent lampblack before the scrubbers are reached, incorporating it into the general mass. In water gas making, the gas, while very highly heated, is forced against a comparatively heavy pressure through a quantity of cool water; after this bath, there is some free carbon that can never be intimately blended with the tar. (Note P.)

In some of the fractions of oil tar I have found it 12 to 15 per cent. of pure benzol, some toluol and allied compounds; some succeeding fractions are nearly all naphthaline. Some of the tar oils are almost entirely a solution ot benzol and naphthaline. But I find that, even with low heats, the use of benzol or naphthaline solutions in the Lowe apparatus, for enriching the water gas, will bring down these fine oils, so that a large volume of lampblack will be found in the tar drains, and the water gas will receive little light giving gas. The emulsion of water and oil tar separates easily under moderate heating, but a considerable quantity of black and water pumped in with the emulsion will either delay the separation, or (occasionally) completely prevent it. An analytical examination of the tar emulsion and of the tar is given in Note Q. The maximum observed efficiency of this system was the separation, from its emulsion, of 3,500 gallons of clear tar per day, using a tank with a capacity of 27,000 gallons, and fitted with a steam coil of 380 feet of 1-inch pipe, having a heating surface of 128 square feet, and using steam at 110 lbs. pressure.

The Committee on Research suggested that the effect of tar vapors on candle power be determined. The composition of the gas, and the amount of hydrocarbons (tar vapors) removed by condensing and scrubbing have been carefully examined by J. E. Blomen (See "Light, Heat and Power," June 15, 1888). An abstract of his work is given in Note R. At the Bay State Works, in 1901, a series of observations was made on the candle power of the gas as follows:

Lowe Double Superheater Apparatus.

Month.	Gas Temperature. A	Gas Temperature. B	Duration of Test.	Candle Power. A	Candle Power. B	Loss of Candle Power. Candles. Per Cent.	Enricher Used.
July	82°	73°	16 days	25.84	25.48	.36=1.4	Naphtha.
August	85°	72°	20 days	25.58	25.54	.04=0.16	Gas oil.

B is at inlet to station meter.

A is a point in the line of flow so that after passing A the gas flows through tubular condensers, dry scrubbers, the layers of filter shavings

1. See "Berlin normals, Pre-purifiers," American Gas Light Journal, March 4, 1895; Volume 62, page 300. Also same Journal, November 12, 1900; Volume 73, page 765—W. C. Morris, on "Removal of Tar from Water Gas," 28th meeting American Gas Light Association.

and then the oxide in the purifiers. Before reaching A the fresh made gas has passed through condensers and dry scrubbers. I do not regard this test as definitive, and I doubt whether a fair average sample of crude gas—drawn from the apparatus in use—can be delivered unchanged at the burner in the photometer.

In 1897, I undertook an investigation of the physical condition of the gas at successive steps between the wash box and the street main, but the plural vapors in the gas, and the impossibility of testing exactly the same gaseous mixture, at different points along the line of flow, led me to compute the elements of a table showing the probable volumetric and gravimetric changes in carburetted water gas, saturated with aqueous vapor only. (Note S, Table IX.) Since this table was first published (American Gas Light Journal, March 8, 1897; Volume 66, page 362) I have made many additional tests on the gas to observe the volume of tar and water condensed from the gas by successive reductions in temperature. In a general way, I have found that above 100° the agreement is close between the observed deposition of total liquid (tar and water) and the computed deposition of condensed aqueous vapor, as given in Table IX. The higher the temperature the closer the agreement. Thus, at the wash box, with gas at 192°, saturated with vapor, the table indicates that each 1,000 cubic feet of holder gas will take from the wash box 91 pounds (nearly 11 gallons) of water and tar. Then, measuring the water flowing into the wash box, and observing the rate of make of the gas, I find that if the supply of seal water falls below 11 gallons per 1,000 cubic feet the seal will be lost; *i.e.*—the wash box is being supplied with less water than the gas is taking away.

At temperatures below 100°, the agreement in Table IX. between theory and practice is close if the rate of flow of the gas is slow, or if the gas encounters sufficient deposition surface. Thus, in a test from 45° to 36° on a large volume (70 million cubic feet) of gas, the collected condensed water and light tar oil together agreed exactly with the weight for water only, as given in Table IX. But if the flow of gas is fast, and if the tar and water are not then removed by scrubbing or filtering, the temperature of the gas will fall while it still carries along the condensed entrained water and tar. For the purposes of design of apparatus and manufacture of gas, Table IX. is sufficiently accurate to be of practical application. For example, from Table IX. it can be deduced that, in general, cooling water gas by air is not economically practicable. In 1900, at the Bay State Works, a test was made on cooling carburetted water gas from 180° to 172°, using 5,000 cubic feet air per minute. The heat lost by the gas and the heat absorbed by the air were in satisfactory agreement, and both amounts agreed with the heat as calculated prior to the test, from the data in Table IX. It was found that cooling by air gave no promise of economy, under the existing circumstances of manufacture.

Where no provision is made for repeated circulation of the water as supplied to the wash box, it is evident that there will at once be set up a heavy flow, ranging in amount from 11 to 7 gallons per 1,000 cubic feet of gas made (11 gallons when running high heats and using hot water in the wash box, 7 gallons when running low heats and using cold water in the wash box). This must flow through the tar well, and thence into some convenient sewer, river or bay. I have observed one drop of tar and lampblack spread evenly and without a break over 100 square feet of water surface. Thus an uninterrupted overflow from the tar well may carry away to loss valuable tar, and may contribute cause for complaint.

When the tar and water have been separated from the gas, when the water has been separated from the tar, and when the tar has been sold, or profitably used, this residual should figure in the record of enriching effect of the oil used. If 5 gallons of oil per 1,000 give 30-candle power gas, and if there is a residual of 1 gallon of tar per 1,000, then

the gross efficiency of the oil is $30 \div 5 = 6$ candles per gallon;
the net efficiency of the oil is $30 \div 4 = 7.5$ candles per gallon.

Four gallons of the original enricher remain in the gas, and give the measured illumination. Any complete statement of carburetted water gas should include not only the candle power of the gas, and the kind and amount of oil used, but also the amount of clear tar recovered. The best net efficiency per gallon of oil, at Bay State Works, has been

for gas oil, 7.29 candles per gallon;
for naphtha, 6.72 candles per gallon.

It is always to be expected that laboratory facts will not agree exactly with factory facts. President Charles W. Eliot, of Harvard University, in an address at the Brooklyn Institute of Arts, said, "Any one who desires to attain to the capacity for exact observation and exact description, and knows what it is to draw a correct inference from well determined premises * * * has learned how hard it is to determine a fact, and to state it accurately."

Note A.—*Papers bearing upon Oil Tar.*

Abbreviations Used.	A.G.L.A.	American Gas Light Association.
	N.E.A.G.E.	New England Association of Gas Engineers.
	O.G.L.A.	Ohio Gas Light Association.
	P.C.G.A.	Pacific Coast Gas Association.
	W.G.A.	Western Gas Association.

In this, and in succeeding notes, all references are to the American Gas Light Journal, by date and by page, unless otherwise stated.

1891, Aug. 3, Vol. 55, p. 155.—Analysis of 3 samples of crude petroleum. —Durand Woodman.

1891, Nov. 16, Vol. 55, p. 695.—The manipulation of tar from carburetted water gas.—David Douglas. A. G. L. A.

1892, June 6, Vol. 56, p. 810.—Petroleum products—hydrocarbon employed in gas manufacture.—C. M. Higgins. W. G. A.

1892, Aug. 29, Vol. 57, p. 296.—In a paper on "Enriching Coal Gas," is an analysis of oil tar.—J. MacKay.

1892, Nov. 21, Vol. 57, p. 729.—Water gas condensation.—J. M. Rusby. A. G. L. A.

1893, Jan. 23, Vol. 58, p. 114.—In a paper on "Naphthaline," is a sketch of a still now sometimes used on oil tar.

1894, Jan. 8, Vol. 60, p. 38.—Oil gas tar.—Durand Woodman.

1894, April 9, Vol. 60, p. 517.—In discussion of paper on "Coal Tar Pitch," is description of separator for water gas tar for works making 160 to 180 million.—A. S. Miller.

1894, May 14, Vol. 60, p. 690.—Oil gas tar.—Durand Woodman.

1894, June 11, Vol. 60, p. 849.—Separation of water from (coal) tar.—Theodor Petersen.

1894, June 18, Vol. 60, p. 881.—Filter for tar well overflow.—C. M. Keller. W. G. A., Wrinkle 11.

1894, June 18, Vol. 60, p. 883.—Disposal of fresh water from water gas plant.—W. Lee Brown. W. G. A., Wrinkle 18.

1894, Oct. 15, Vol. 61, p. 544.—Oil gas. (See caption "Tar," page 546.) —Noyes, Blinks and Mory.

1894, Nov. 5, Vol. 61, p. 654.—Petroleum, its products and their relation to the gas industry.—C. H. Evans. A. G. L. A.

1894, Dec. 3, Vol. 61, p. 798.—Lowe's gas cleaner. (Patent specification.)

1895, Jan. 28, Vol. 62, p. 119.—The determination of tar in gas.—W. Leybold.

1895, Nov. 11, Vol. 63, p. 779.—Technical analysis of asphalts.—S. P. Sadtler.

1896, Aug. 24, Vol. 65, p. 282.—Oil tar and its uses.—J. B. Grimwood. P. C. G. A.

1896, Sept. 14, Vol. 65, p. 410.—Tar extractor. (Patent specification.) —I. N. Knapp.

1896, Nov. 23, Vol. 65, p. 815.—The Velna process for the manufacture of briquettes from waste coal and mineral tar.

1896, Nov. 30, Vol. 65, p. 846.—Separation of water gas tar.—Alten S. Miller. A. G. L. A.

1897, May 31, Vol. 66, p. 857.—An oil tar separator and its results.—J. R. Lynn. W. G. A.

1899, Mar. 6, Vol. 70, p. 335.—In a paper on "The Nuisance Question in Gas Works" is a description of a tar separator.—F. H. Shelton. N. E. A. G. E.

1899, Dec. 25, Vol. 71, p. 1011.—Texas petroleum. (With fractional distillations.)—F. C. Thiele.

1900, Feb. 12, Vol. 72, p. 246.—In paper on Crystal Palace gas works is description of circulating water for wash box seal.

1900, Mar. 26, Vol. 72, p. 482.—Some notes on oil and tar burning. (Coal tar and oil tar.)—B. J. Allen. N. E. A. G. E.

1900, Aug. 20, Vol. 73, p. 282.—Some chemical and physical characteristics of California petroleum.—A. S. Cooper.

1900, Aug. 27, Vol. 73, p. 326.—Tar extractor for tubular condenser.—R. L. Clarke. P. C. G. A., Wrinkle 4.

1900, Nov. 12, Vol. 73, p. 765.—Removal of tar from water gas.—W. C. Morris. A. G. L. A.

1901, Sept. 9, Vol. 75, p. 405.—Practical testing of oils for gas and fuel purposes.—L. P. Lowe. P. C. G. A.

In "Proceedings of American Gas Light Association," Vol. XV., pp. 69 and 70, there is a description of apparatus for separating water from oil tar.

Note B.—*Value of Oil Tar.*

(References are to the American Gas Light Journal.)

1891, Mar. 23, Vol. 54, p. 399.—We are getting some 6 cents per gallon for water gas tar, where using crude Lima oil.—F. H. Shelton.

1891, April 6, Vol. 54, p. 486.—Some of it was worked up by simple treatment into an excellent varnish for painting and preserving, selling for $10 per barrel. In several places that I know of 6 to 9 cents a gallon is a current price paid for water gas tar with water eliminated. —F. H. Shelton. O. G. L. A.

1891, June 15, Vol. 54, p. 853.- Oil tar is now turned over to chemical works and tar distillers at a price invariably in excess of the cost of an equal quantity of the original oil, and in some localities at double this cost.—A. G. Glasgow.

1891, Nov. 16, Vol. 55, p. 702.—Distillers buy tar with 20 per cent. water in it, and pay a price almost as great as coal tar is selling for in the immediate neighborhood.—Alten S. Miller. A. G. L. A.

1892, Mar. 14, Vol. 56, p. 368.—Oil gas tar or water gas tar is really more valuable, when once separated, than is coal gas tar.—A. C. Humphreys. N. E. A. G. E.

1892, Mar. 14, Vol. 56, p. 369.—The tar from water gas is unquestionably for many purposes of better quality than coal tar.—A. C. Humphreys. N. E. A. G. E.

1892, June 6, Vol. 56, p. 811.—In Wilmington, Del., tar from oil gas (free from water) is sold at as good a price as coal tar.—F. Egner. W. G. A.

1892, June 6, Vol. 56, p. 812.—Must regard tar made from use of crude oil as a residual worth from 4 to 10 cents per gallon.—A. C. Humphreys. W. G. A.

1892, June 6, Vol. 56, p. 814.—Cannot get 4 cents per gallon for tar from crude oil. Am offered 2.5 cents per gallon for tar from naphtha.—C. R. Faben. W. G. A.

1892, Nov. 21, Vol. 57, p. 733.—Tar with less than 8 per cent. water can sell for about 70 cents per barrel.—W. R. Addicks. A. G. L. A., Question 5.

1893, June 5, Vol. 58, p. 809.—Coal tar should be worth two or three times more than oil tar.—Editorial.

1894, Nov. 5, Vol. 61, p. 656.—2.5 barrels tar equal 1 ton coal, as fuel. —W. H. Pearson, Jr. A. G. L. A.

1896, Nov. 30, Vol. 65. p. 847.—Worth 1.75 cents per gallon in New York city. Worth, for fuel, 1.125 cents per gallon in New York city. —Alten S. Miller. A. G. L. A.

1898, Jan. 10, Vol. 68, p. 53.—Seven cents per gallon at Key West.— "Traveller."

1900, Mar. 26, Vol. 72, p. 485.—Worth more than 2 cents per gallon as fuel at Bay State Gas Works.—W. E. McKay. N. E. A. G. E.

NOTE C, TABLE I.—*Gas Made in Massachusetts (Years End June 30). In Cubic Feet.*

Year.	Coal Gas.	P. Ct.	Water Gas.	P. Ct.	Oil Gas.	Total Gas.
1900	2,001,542,000	41	2,880,360,000	59	9,075,000	4,890,977,000
1899	1,864,437,000	36	3,265,173,000	64	8,372,000	5,137,982,000
1898	1,759,332,000	36	3,166,847,000	64	8,247,000	4,934,426,000
1897	1,654,454,000	35	3,079,843,000	65	10,965,000	4,745,262,000
1896	1,767,591,000	38	2,875,566,000	62	14,519,000	4,657,676,000
1895	1,532,989,000	39	2,413,266,000	61	12,518,000	3,958,773,000
1894	1,544,787,000	43	2,021,897,000	57	13,100,000	3,579,784,000
1893	2,110,538,000	59	1,466,757,000	41	15,589,000	3,592,884,000
1892	2,326,472,000	65	1,230,816,000	35	13,600,000	3,570,888,000
1891	2,645,861,000	77	777,005,000	23	13,053,000	3,435,919,000
1890	3,138,120,000	94	209,819,000	6	12,476,000	3,360,415,000
1889	3,101,200,000	97	75,696,000	3	11,600,000	3,188,496,000
1888	2,976,881,000	98	47,119,000	2	10,402,000	3,034,402,000
1887	2,738,833,000	99	28,404,000	1	10,600,000	2,777,837,000
1886	.....	..	.....	..	10,300,000	2,636,300,000

In 1900, the gas of the Massachusetts Pipe Line Company has not been included, because the corresponding residuals are not returned in the Report of the Board of Gas Commissioners. Adding the 664,147,000 made (bought) by the Massachusetts Pipe Line Company, figures of the components and total for the year 1900 become—

Year.	Coal Gas.	P. Ct	Water Gas.	P. Ct.	Oil Gas.	Total Gas.
1900	2,665,689,000	48	2,880,360,000	52	9,075,000	5,555,124,000

NOTE D, TABLE II.—*Enriching Oils Used in Coal Gas Made in Massachusets. In Gallons.*

Year.	Naphtha.	*Gas Oil.	Crude Oil.	Total Oils.	Oil per ton of Total Coal.	Oil per 1,000 cu. ft. Gas.
1900	69,754	467,171	.....	536,925	2.86	.27
1899	48,368	435,729	.....	484,097	2.84	.26
1898	105,650	438,990	.....	544,640	3.38	.31
1897	127,172	425,823	.....	552,995	3.62	.33
1896	27,754	396,767	23,545	448,066	2.78	.25
1895	38,120	422,474	38,951	499,545	3.79	.33
1894	315,135	385,570	99,808	800,513	5.62	.52
1893	197,429	297,343	73,281	568,053	2.96	.27
1892	292,122	158,943	214,978	666,043	3.32	.29
1891	1,112,196	146,421	310,791	1,569,408	7.08	.59
1890	826,755	239,703	189,052	1,255,510	4.45	.40
1889	1,145,356	235,635	137,614	1,518,605	5.50	.49
1888	1,112,228	141,400	58,771	1,312,399	4.67	.44
1887	1,045,043	87,843	41,906	1,174,792	4.84	.43
1892				7,921		
1891				12,450		
1890				46,050		
1889				56,300		
1888				23,200		
1887				10,575		

*Under the head of gas oil, there is included residuum as above.

NOTE E, TABLE III.—*Enriching Oils Used in Water Gas Made in Massachusetts. In Gallons.*

Year.	Naphtha.	P. Ct.	Gas Oil.	P. Ct.	Crude Oil.	P. Ct.	Total Oils	Per M.
1900	5,895,090	45	7,133,791	55	898	..	13,029,779	4.52
1899	11,985,690	82	2,566,953	18	350	..	14,552,993	4.46
1898	13,396,827	94	860,801	6	350	..	14,257,978	4.50
1897	7,732,688	56	4,989,264	36	1,094,986	8	13,816,938	4.49
1896	7,203,070	52	3,356,419	24	3,244,197	24	13,803,686	4.80
1895	7,770,199	67	3,565,815	31	289,679	2	11,625,693	4.82
1894	8,877,983	96	47,127	..	408,672	4	9,333,782	4.61
1893	6,943,377	97	.....	..	246,642	3	7,190,019	4.90
1892	5,141,406	85	.....	..	919,371	15	6,060,777	4.92
1891	3,146,445	85	.....	..	537,822	15	3,684,267	4.74
1890	627,690	59	.....	..	443,430	41	1,071,120	5.10
1889	321,309	77	.....	..	97,745	23	419,054	5.54
1888	251,554	83	.....	..	49,960	17	301,514	6.40
1887	170,823	100	.....	..	.....	..	170,823	6.01

NOTE F, TABLE IV.—*Enriching Oils Used in Oil Gas Made in Massachusetts. In Gallons.*

Year.	Naphtha.	Gas Oil.	Crude Oil.	Total Oils.	Total Oil Per M.
1900	96,573	27,203	.....	123,776	13.64
1899	122,163	25,459	.....	147,622	17.63
1898	153,691	25,571	.....	153,691	18.64
1897	67,452	67,727	17,790	152,969	13.95
1896	123,712	39,630	19,900	183,242	12.62
1895	94,901	21,556	36,955	153,412	12.26
1894	36,452	.....	89,910	126,452	9.65
1893	89,604	22,970	77,592	190,166	12.20
1892	25,416	23,450	74,845	123,711	9.10
1891	46,075	18,956	79,833	144,864	11.10
1890	34,861	.....	86,002	120,863	9,69
1889	43,662	.....	78,470	122,132	10.53
1888	20,061	5,376	95,942	121,479	11.68
1887	11,034	89,380	.....	100,414	9.47

NOTE G, TABLE V.—*For Coal Gas (Massachusetts).*

I Year.	II. Coal Tons.	III. Cannel Tons.	IV. Total Coal.	V. Gas Per Ton.	VI. Oil Per Ton. Gals.	VII. (see Below for Explanation)	VIII.
1900	186,832	992	187,824	10,657	2.86	2,347,800	4.66
1899	169,684	856	170,540	10,933	2.84	2,131,750	4.49
1898	159,882	1,204	161,086	10,921	3.38	2,013,575	6.22
1897	149,487	3,068	152,555	10,845	3 62	1,906,933	6 50
1896	159,188	1,950	161,138	10,969	2.78	2,014,225	6 46
1895	129,560	2,128	131,688	11,641	3.79	1,646,100	6 15
1894	141,243	1,070	142,313	10,848	5.62	1,778,913	6.39
1893	190,759	1,115	191,874	11,000	2.96	2,398,425	6 33
1892	199,491	979	200,470	11,605	3.32	2,505,875	6.62
1891	219,690	1,987	221,677	11,936	7.08	2,770,963	5 67
1890	278,991	3,164	282,155	11,122	4.45	3,526,938	3.33
1889	273,268	3,037	276,305	11,224	5.50	3,453,813	2.69
1888	266,850	4,386	271,236	10,975	4.84	3,390,450	2.41
1887	246,657	4,689	251,346	10,897	4.67	3,141,825	2.13
1886	235,742	....	.....	.....	....	.....	....

Some coal tar was burned, or disposed of otherwise than by sale.

Some oil tar was sold, and the income from this is included in the total income from sales of tar, as reported by the Board of Gas Commissioners. (See Note H, Table VI., for income from sales of residuals.)

Not all the sales of oil tar are separately given in the Commissioners' Reports, but from such companies as are so reported it is found that—

In 1900, 72 per cent. of water gas made yielded $13,528 from residuals.
" 1899, 77 " " " " 9,192 "
" 1898, 79 " " " " 4,638 "
" 1897, 80 " " " " 11,825 "
" 1896, 66 " " " " 1,180 "
" 1895, 62 " " " " 4,308 "

From the water gas yielding the above residuals, there was tar burned, varying from 70,000 to 537,000 gallons per annum.

As nearly as can be determined from the Commissioners' Reports, the total sales of oil tar did not exceed—as follows:

1900....$18,789	1899....$11,938	1898 .. $5,871
1897.... 14,780	1896.... 1,788	1895.... 6,498

Prior to 1895 the sales of oil tar cannot be determined.

If the net incomes from sales of coal tar thus determined are considered, and if 12.5 gallons coal tar are sold per ton of total coal carbonized, then (and only with such qualifications) column VII., Table V., gives the total gallons coal tar sold. Column VIII., Table V., gives average price, in cents, received for the coal tar sold.

NOTE H, TABLE VI.—*Income from Sales of Residuals. Includes all Companies in Massachusetts Reports.*

Year.	Coke.	Pr. Ct,	Tar.	Pr. Ct.	Ammonia.	Pr. Ct.	Total.
1900.....	$242,896	61	$128,259	32	$28,694	7	$399,849
1899.....	218,186	63	107,718	31	21,413	6	347,317
1898.....	205,184	57	131,148	37	19,589	6	355,921
1897.....	183,739	54	138,649	40	21,625	6	344,013
1896.....	177,245	53	131,925	39	27,133	8	336,303
1895.....	168,236	56	107,959	36	22,600	8	298,795
1894.....	191,388	60	113,732	36	14,858	4	319,978
1893.....	246,726	58	151,735	36	23,702	6	422,163
1892.....	241,288	56	163,940	39	21,123	5	428,351
1891.....	266,581	60	157,183	35	22,812	5	446,576
1890.....	344,897	70	117,604	24	29,637	6	492,138
1889.....	350,451	74	92,946	20	29,778	6	473,175
1888.. ...	360,435	77	81,647	18	24,060	5	466,142
1887.....	290,692	76	66,881	18	23,371	6	380,944
1886.....	....	..	....	..	....	.	347,985

NOTE J, TABLE VII.—*For Coal Gas, Income from Sales of Residuals, per Ton of Total Coal.*

Year.	Coke.	Tar.	Ammonia.	Total.
1900.....	$1.233	$0.583	$0.153	$2.029
1899.....	1.279	.562	.126	1.967
1898.....	1.274	.778	.122	2.172
1897.....	1.204	.812	.142	2.158
1896.....	1.100	.808	.168	2 076
1895.....	1.278	.770	.172	2.220
1894.....	1.345	.799	.104	2.248
1893.....	1.286	.791	.124	2.200
1892.....	1.204	.828	.105	2.137
1891.....	1.203	.709	.103	2.015
1890.....	1.222	.417	.105	1.744
1889	1.268	.336	.108	1.712
1888.....	1.329	.301	.089	1.719
1887.....	1.157	.266	.093	1.516
1886.....	....	....	....	.....

The net sales of coal tar are obtained by deducting from the total sales of tar the amounts named in the foot note to Table V. as the limiting income from sales of oil tar. Prior to 1895 the figures are not corrected for any sales of oil tar.

NOTE K, TABLE VIII.—*Bay State Gas Company, of Massachusetts. Enriching Oils Used.*

Year.	Naphtha.	Gas Oil,	Crude Oil.	Total Oils.
1900	54,104	4,722,194	.....	4,776,298
1899.....	2,723,307	2,076,715	.....	4,800,022
1898.....	4,528,877	433,576	.....	4,962,453
1897.....	.....	4,027,181	1,094,636	5,121,817
1896.....	100,095	2,035,853	3,172,180	5,308,128
1895.....	383,418	3,522,991	.....	3,906,409
1894.....	3,959,110	47,127	61,226	4,067,463
1893.....	4,711,241	.....	.....	4,711,241
1892.....	4,194,707	.....	.....	4,194,707

Year.	Water Gas Made.	Tar Burned Gals.	Income from Residuals. Total.	Per M.
1900.....	1,013,453,000	70,000	$13,284.73	$0.01311
1899	1,050,195,000	.....	8,924.62	.0085
1898.....	1,061,850,000	.....	4,289.85	.00404
1897...	1,077,467,000	138,873	11,070.89	.01027
1896.....	1,071,236,000	536,331	955.43	.00089
1895.....	887,878,000	292,688	3,661.35	.00413
1894.....	857,739,000	.....	2,933.54	.00377
1893.....	968,157,000	.....	195.45	.0002
1892.....	885,480,000	.....	469.63	.00053

This Company has used more than a million gallons of oil tar as fuel, under several forms of boilers, and the use of the tar has been thoroughly satisfactory for making steam and for saving coal. Three-fourths of a gallon of tar burned per 1,000 cubic feet of gas made furnished all the steam (110 lbs. pressure) used in the works.

(AMERICAN GAS LIGHT JOURNAL, March 26, 1900. Volume 72, pages 484, 485.)

NOTE L.—*Uses of Oil Tar.*

(References are to the AMERICAN GAS LIGHT JOURNAL.)

1891, Nov. 16, Vol. 55, p. 696.—Makes good, cheap asphalt paths; makes bright, glossy varnish.—David Douglas. A. G. L. A.

1892, Feb. 1, Vol. 56, p. 151.—One gallon refuse oil or tar can yield 500 cubic feet hydrogen.—Reprinted from *Gas World.*

1892, Mar. 14, Vol. 56, p. 369.—Water gas tar is better than coal tar for paint making.—A. C. Humphreys. N. E. A. G. E.

1892, Oct. 24, Vol. 57, p. 579.—Oil from oil gas * * * a most excellent solvent for poor paint, or paint badly put on.—A. W. Wilkinson.

1892, Nov. 21, Vol. 57, p. 733.—Used for painting buildings and ironwork.—J. P. Harbison. A. G. L. A. Question 5.

1894, April 9, Vol. 60, pp. 516 & 517.—Oil tar pitch has been used for paving and roofing purposes * * * with good success. It is a very fair substitute.—It does fairly well.—Watt (Chicago). O. G. L. A.

1894, April 9, Vol. 60, p. 517.—A manager of a tar factory told me that he could not get enough water gas tar; he has found it makes a perfectly pure asphaltum, a valuable product. It makes a deodorized paper.—J. H. Somerville. O. G. L. A.

1896, Aug. 24, Vol. 65, p. 283.—Used for pavements and paint.—J. B. Grimwood. P. C. G. A.

1896, Aug. 24, Vol. 65, p. 284.—Paint for gasholder roofs.—Eichbaum. P. C. G. A.

1896, Aug. 24, Vol. 65, p. 284.—Makes a paint mixed with turpentine.—Powers. P. C. G. A.

1896, Nov. 23, Vol. 65, p. 815.—Used with waste coal, for making briquettes.—Reprint from *L'Industrie.*

1897, Aug. 16, Vol. 67, p. 250.—Use oil tar for services; it is the best paint to be used around gas works, for any kind of ironwork.—Thomas D. Petch. P. C. G. A.

1897, Sept. 13, Vol. 67, p. 407.—Use for paint on ironwork.—Eichbaum. P. C. G. A.

1897, Sept. 27, Vol. 67, p. 489.—Distillate of oil tar will remove naphthaline.—Young and Glover (England).

1898, Jan. 10, Vol. 68, p. 53.—For the nets and boats of fishermen.—"Traveller" at Key West.

1899, July 17, Vol. 70, p. 87.—Water gas tar is a very good preservative for wrought iron pipe.—J. R. Lynn. O. G. L. A.

1901, April 8, Vol. 74, p. 525.—Paint for holder tank and holder, and for brick and stone walls.—J. P. Harbison. O. G. L. A.

1901, Sept. 2, Vol. 75, p. 362.—Used for coating timber posts, in the soil.—E. C. Jones. P. C. G. A.

NOTE M.—*Percentage of Tar Made.* References are to the AMERICAN GAS LIGHT JOURNAL. Note that the apparatus used is not given.

1890, April 28, Vol. 52, p. 590.—There is no necessity for making a particle of waste oil.—A. W. Wilkinson.

1890, Dec. 8, Vol. 53, p. 804.—14.3 per cent. tar, with crude petroleum.—A. G. Glasgow.

1891, June 15, Vol. 54, p. 853.—With Lima crude oil, 15 per cent. tar, containing 25 per cent. water.—A. G. Glasgow. (*Note*—this equals 11.5 per cent. net.)

1891, Nov. 16, Vol. 55, p. 697.—In 1888, yield was 12.6 per cent. tar. In 1891, yield was 5.6 per cent. tar, from Lima crude oil.—David Douglas. A. G. L. A.

1892, March 7, Vol. 56, p. 334.—.7 gallon tar is made per 1,000 cubic feet gas.—Neal (Charlestown). N. E. A. G. E.

1892, March 14, Vol. 56, p. 362.—2.5 per cent. tar from naphtha.—W. E. McKay. N. E. A. G. E.

1892, April 11, Vol. 56, p. 530.—Water gas from naphtha yields practically no tar.—C. H. Welch, in a paper on "The Present and Future Coal Tar Market." O. G. L. A.

1893, April 10, Vol. 58, pp. 520, 521.—With naphtha, .4 of 1 per cent. of tar. With crude oil, 7 per cent. of tar.—Alten S. Miller, in a paper on "Oils for Gas Enriching." O. G. L. A.

1894, Nov. 5, Vol. 61, p. 656.—With crude oil, tar made equals 10 per cent.—W. H. Pearson, Jr. A. G. L. A.

1895, Nov. 18, Vol. 63, p. 815.—One-eighth gallon of tar, per gallon of gas oil used.—E. G. Pratt. A. G. L. A.

1896, Nov. 30, Vol. 65, p. 846.—8 per cent. tar, with gas oil or heavy residuum.—Alten S. Miller. A. G. L. A.

1896, Nov. 30, Vol. 65, p. 847.—Tar well has a capacity for 1.25 gallons tar per 1,000 cubic feet gas made.—J. M. Rusby. A. G. L. A.

1899, June 26, Vol. 70, p. 968.—With gas naphtha, tar is a negligible quantity. With gas oil, tar is 1.54 per cent.—Paul Doty. W. G. A.

NOTE N.—*Fractional Distillations, Exhibited at Madison Square Garden, New York, February, 1897, by the United Gas Improvement Company.*

NAPHTHA.

Specific Gravity = .6930, or 72° Beaumé at 60° F. Color white.

Fraction.	Vol. P. Ct.	Wt. P. Ct.	Sp. Gr.	Beaume.	Color.
100°–150°	10.90	10.34	.6579	83°	white.
150 –200	54.09	53.69	.6885	73.5	white.
200 –250	28.00	29.07	.7196	64.5	white.
250 –300	4.20	4.45	.7370	60	white.
Above 300	1.75	1.91	.7560	55	clear red-brown.
Residue	none appreciable.				
	98.94	99.46			

GAS OIL.

Specific Gravity = .8462, or 35°.3 Beaumé at 60° F. Color dark.

Fraction	Vol P. Ct.	Wt. P. Ct.	Sp. Gr.	Beaume.	Color.
180°–300°	4.40	3.83	.7369	60°	white.
300 –350	4.55	4.10	.7639	53.5	nearly white.
350 –400	3.50	3.24	.7823	49	nearly white.
400 –450	6.30	5.95	.8001	45	nearly white.
450 –500	6.95	6.73	.8108	40.75	slightly yellow.
500 –550	10.45	10.27	.8320	38.5	pale yellow.
550 –600	16.35	16.46	.8491	35	pale yellow.
600 –650	21.95	22.17	.8625	32.25	pale yellow.
650 –700	18.35	18.99	.8764	29.75	yellow.
Above 700	7.50	7.98	.9009	25.5	dark.
Residue	....	.30	solid	....	black.
	100.30	100.02			

CRUDE OIL.

Specific Gravity = .8335, or 38° Beaumé at 60° F. Color dark.

Fraction.	Vol. P. Ct.	Wt. P. Ct.	Sp. Gr.	Beaume.	Color.
130°–200°	5.00	4.10	.6840	74°.5	clear white.
200 –250	5.20	4.49	.7193	64.5	clear white.
250 –300	8.00	7.14	.7443	58	clear white.
300 –350	6.30	5.77	.7463	53	clear white.
350 –400	6.15	5.77	.7827	49	clear white.
400 –450	6.40	6.14	.8000	45	clear white.
450 –500	7.40	7.23	.8143	42	slightly yellow.
500 –550	7.00	6.94	.8265	39.5	slightly yellow.
550 –600	7.40	7.44	.8379	37	pale yellow.
600 –640	20.85	21.22	.8484	35	brown yellow.
640 –650	16.15	16.48	.8505	34.5	blackish.
Above 650	2.00	2.24	.9363	19.5	blackish.
Residue	....	2.94	....	....	coke-like.
	97.85	97.90			

NOTE O.—*Ash, Lampblack and Naphthaline. Analysis by Dr. Wing at Bay State Gas Works.*

The naphthaline deposit, taken from a condenser tube, after drying, separated into—

95.9 per cent. volatile matter, at 217° F., nearly clear naphthaline, colored by a little oil.

3.5 per cent. carbon and dense hydrocarbons.

.6 per cent. ash, which formed about ¼ the bulk of the substance taken. This ash is silica, colored by iron.

The bulk of the substance left on dissolving the naphthaline is quite voluminous, although very light in weight; this is the lampblack and ash carried by the gas.

A sample of the sediment taken from below the steam coil, near the bottom of the tar-separating tank, when free from liquid tar, shows the pulverulent residue to be almost entirely lampblack, with 4 per cent. mineral matter as dust. This mineral matter is identical with the ash referred to in the preceding analysis.

NOTE P.—*Free Carbon in Tar.*

(References are to AMERICAN GAS LIGHT JOURNAL.)

1894, Jan. 8, Vol. 60, p. 38.—9 per cent. lampblack in clear oil tar; 51 per cent. pitch in oil tar.—Durand Woodman.

1900, July 16, Vol. 73, p. 83.—Coal tar has 20 to 25 per cent. of flocculent, sooty carbon.—William Young.

1901, Mar. 25, Vol. 74, p. 446.—25 per cent. free carbon or lampblack in ordinary gas house tar; 5 to 8 per cent. free carbon or lampblack in Otto-Hoffman coke oven tar.—F. Schniewind.

In experiment at Bay State Works, W. E. McKay found 12 to 15 per cent. free carbon or lampblack in oil tar.

NOTE Q.—*Analysis of Water Gas Tar, Bay State Works, by Dr. John F. Wing.*

Sample.	A.	B.	C.	D.
Sp. gr. Beaume	13°.5	13°.5	13°.5	12°.0
–240 water	.25 pr. ct.	.5 pr. ct.	.25 pr. ct.	14 .0 pr. ct.
–240 oil	4 .25	2 .0	1 .75	8 .0
240–336	.05	1 .0	2 .0	.5
336–400	3 .0	3 .5	3 .0	.5
400–550	29 .0	23 .0	28 .0	20 .0
550–617	5 .0	9 .5	8 .0	7 .0
617–690	17 .0	14 .5	14 .0	11 .0
Hard pitch residue	41 .0	46 .0	42 .5	39 .0
Benzol	.5	.25	.25	.5
Naphthaline	22 .5	17 .0	18 .5	13 .0

Sample A is the separated stored tar.

Sample B is of the tar as pumped into the separating tank, but before heating; this sample is drawn from the tar stratum in the tank.

Sample C is of the tar as pumped from the tar well receiving the drains from the last condensers and scrubbers; this sample is drawn from the tar stratum in the well.

Sample D is of the tar as pumped from the tar well receiving the drains from the wash boxes, first scrubbers and condensers, from which the circulating pump is supplying the wash boxes; this sample is drawn from the tar stratum.

Specific gravity of all samples was nearly 1.1 that of water. At 400° the distillate becomes heavier than water.

At ordinary temperatures the residues left at 550° and 617° were soft pitch, but would not flow.

NOTE R.—*Influence of Condensers and Scrubbers on Composition of Water Gas, by J. E. Blomen, Chicago.*

	A.	B.	C.
Hydrogen	28.83	28.17	28.40
Marsh gas	20.12	25.73	25.87
Light hydrocarbons ($C_n H_n + 2$)	8.12	6.71	6.68
Heavy hydrocarbons	10.62	4.70	4.10
Carbonic oxide	24.18	26.03	26.22
Carbonic acid	2.71	2.98	3.00
Sulphur	2.37	2.51	2.53
Nitrogen	3.05	3.17	3.20

A is of the gas before all condensers.
B is the gas after passing the first condenser.
C is the gas after passing the second condenser.

	E.	F.
Inlet to first scrubber	140°.8	60°.25
Outlet to first scrubber	76 .3	57 .9
Outlet to second scrubber	73 .0	57 .0
Outlet to drying apparatus	75 .4	55 .5

At the end of test E there was 4 per cent. of tar in the sawdust in the

purifying box. At the end of test F there was $\frac{6}{10}$ of 1 per cent. of tar in the sawdust in purifying box.

NOTE S, TABLE IX.—*Table for Carburetted Water Gas saturated with Aqueous Vapor, no other Vapors being present—showing, with Change of Temperature, the Change in Volume of Unit weight of Gas and the Change in Weight of Unit Volume of the Mixture of Gas and Aqueous Vapor* (Computed by W. E. McKAY, 1897).

Barometric variations of pressure exceed the usual variations of pressure at different points in a gas works, and the mixture of gas and vapor has been considered as under the normal pressure of 30″ mercury.

Column I. gives the temperature in degrees Fahrenheit.

Column II. gives the tension of saturated aqueous vapor in inches of mercury, corresponding to the temperature in I. This vapor tension is from Dixon's tables for latitude 53°.

Column III. gives the pressure under which the gas is contained; this pressure is 30″— the vapor tension in Column II.

Column IV. gives the volume of unit weight of gas, at the temperature and pressure given in Columns I. and III. Unit weight of gas (51 pounds) is the weight of the gas in the mixture of 1,000 cubic feet of gas and vapor at 60° F. Unit volume is 1,000 cubic feet.

Column V. gives the weight of aqueous vapor corresponding to the pressure in Column II. and to the volume in Column IV.; this weight is the aqueous vapor carried by unit weight of gas at the temperature given in Column I.

Column VI., the weight of gas and vapor, is 51 pounds + column V.

Column VII. gives the weight of the mixture of gas and vapor occupying 1,000 cubic feet at the temperature and pressures stated.

I. Temp. Degrees F.	II. Vapor Tension.	III. Gas Pressure = 30″—II.	IV. Volume of Unit Weight of Gas. (51 pounds.)	V. Weight of Volume (Col. IV.) of Aqueous Vapor in lbs.	VI. Weight of Gas and Vapor = V + 51.00.	VII. Weight of 1,000 cu. ft. Gas and Vapor at Temp. I. Pressures II, and III.
200	23.435	6.565	5790	167.24	218.24	38.29
199	22.953	7.047	5302	152.60	203.60	38.41
198	22.480	7.520	4961	140.05	191.05	38.51
197	22.016	7.984	4666	129.19	180.19	38.62
196	21.559	8.441	4406	119.67	170.67	38.73
195	21.110	8.890	4177	111.25	162.25	38.84
194	20.669	9.331	3974	103.75	154.75	38.94
193	20.236	9.764	3792	97.10	148.10	39.06
192	19.810	10.190	3628	81.08	142.08	39.16
191	19.392	10.608	3479	85.64	136.64	39.27
190	18.981	11.019	3344	80.70	131.70	39.38
189	18.577	11.423	3221	76.19	127.19	39.49
188	18.181	11.819	3109	72.07	123.07	39.59
187	17.792	12.208	3005	68.28	119.28	39.70
186	17.410	12.590	2909	64.78	115.78	39.80
185	17.034	12.966	2820	61.55	112.55	39.91
184	16.666	13.334	2737	58.56	109.56	40.01
183	16.304	13.696	2662	55.67	106.77	40.11
182	15.949	14.051	2591	53.18	104.18	40.22
181	15.600	14.400	2524	50.75	101.75	40.32
180	15.258	14.742	2461	48.49	99.49	40.42
179	14.922	15.078	2403	46.37	97.37	40.52
178	14.592	15.408	2348	44.37	95.37	40.62
177	14.268	15.732	2296	42.49	93.49	40.72
176	13.951	16.049	2247	40.72	91.72	40.82
175	13 639	16.361	2201	39.05	90.05	40.92
174	13.333	16.667	2157	37.48	88 48	41.03
173	13 033	16.967	2115	35.99	86.99	41.13
172	12.739	17.261	2076	34 58	85 58	41.23
171	12.450	17.550	2039	33.23	84 23	41.32
170	12.167	17.833	2003	31.96	82.96	41.42
169	11.889	18.111	1969	30.75	81.75	41.52
168	11.617	18.383	1937	29.60	80.60	41 61
167	11.350	18.650	1906	28.51	79.51	41.71
166	11.088	18.912	1877	27.47	78.47	41 81
165	10.831	19.169	1849	26.47	77.47	41.91
164	10.579	19.421	1822	25.52	76.52	42.01
163	10.332	19.668	1796	24.61	75.61	42.10
162	10.090	19.910	1771	23.74	74.74	42.20
161	9.853	20.147	1748	22 91	73.91	42.29
160	9.621	20.379	1725	22.12	73.12	42.39
159	9.393	20.607	1703	21.35	72.35	42.48
158	9.170	20.830	1682	20.62	71.62	42.58
157	8.951	21.049	1662	19.92	70.92	42.67
156	8 737	21.263	1643	19.25	70.25	42.77
155	8 527	21 473	1624	18.60	69 60	42.86
154	8.321	21.679	1606	17.98	68 98	42 96
153	8 120	21.880	1588	17.39	68.39	43.06
152	7 922	22.078	1572	16.81	67 81	43 15
151	7.729	22.271	1556	16.26	67.26	43.24
150	7.540	22.460	1540	15.73	66.73	43.34
149	7.354	22.646	1525	15.21	66.21	43.42
148	7.173	22.827	1510	14.72	65.72	43.52
147	6.996	23.004	1496	14.25	65.25	43.62
146	6.822	23.178	1482	13.79	64.79	43.71
145	6.651	23.349	1469	13.35	64.35	43.80
144	6.485	23.515	1457	12.92	63.92	43.89
143	6.322	23.678	1444	12.51	63.51	43.98
142	6.162	23.838	1432	12.11	63.11	44.08
141	6.006	23.994	1420	11.73	62.73	44.17
140	5.854	24.146	1409	11.36	62.36	44.26
139	5.704	24.296	1398	11.00	62.00	44.35
138	5.558	24.442	1387	10.65	61.65	44.44
137	5.415	24.585	1377	10.32	61.32	44.53
136	5.275	24.725	1367	10.00	61.00	44.63
135	5.139	24.861	1357	9.68	60.68	44.72
134	5.005	24.995	1347	9.38	60.38	44.81
133	4.874	25.126	1338	9.09	60.09	44.91
132	4.747	25.253	1329	8.81	59.81	45.00
131	4.622	25.378	1320	8.53	59.53	45.09
130	4.500	25.500	1312	8.27	59.27	45.18
129	4.381	25.619	1304	8.01	59.01	45.27
128	4.264	25.736	1295	7.76	58.76	45.36
127	4.150	25.850	1287	7.52	58.52	45.45
126	4.039	25.961	1280	7.29	58.29	45.55
125	3.930	26.070	1272	7.06	58.06	45.64
124	3.824	26.176	1265	6.84	57.84	45.73
123	3.720	26.280	1258	6.63	57.63	45.82
122	3.619	26.381	1251	6.43	57.43	45.91
121	3.520	26.480	1244	6.23	57.23	46.00
120	3.423	26.577	1237	6.03	57.03	46.09
119	3.329	26.671	1231	5.85	56.85	46.19
118	3.237	26.763	1224	5.67	56.67	46.28
117	3.147	26.853	1218	5.49	56.49	46.37
116	3.059	26.941	1212	5.32	56.32	46.46
115	2.974	27.026	1206	5.15	56.15	46.55
114	2.890	27.110	1200	4.99	55.99	46.64
113	2.809	27.191	1195	4.84	55.84	46.74
112	2.729	27.271	1189	4.69	55.69	46.83
111	2.652	27.348	1184	4.54	55.54	46.92
110	2.576	27.424	1178	4.40	55.40	47.01
109	2,502	27.498	1173	4.26	55.26	47.10
108	2.430	27.570	1168	4.13	55.13	47.20
107	2.360	27.640	1163	4.00	55.00	47.29
106	2.292	27.708	1158	3.87	54.87	47.38
105	2.225	27.775	1153	3.75	54.75	47.47
104	2.160	27.840	1148	3.63	54.63	47.57
103	2.097	27.903	1144	3.52	54.52	47.66
102	2.035	27.965	1139	3.41	54.41	47.75
101	1.975	28.025	1135	3.30	54.30	47.84
100	1.917	28.083	1130	3.20	54.20	47.94
99	1.860	28.140	1126	3.10	54.10	48.03
98	1.804	28.196	1122	3.00	54.00	48.13
97	1.750	28 250	1118	2.90	53.90	48.22
96	1.697	28.303	1114	2.81	53.81	48.32
95	1.646	28.354	1110	2.72	53.72	48.41
94	1.596	28.404	1106	2 63	53.63	48.51
93	1.547	28.453	1102	2.55	53.55	48.60
92	1.500	28.500	1098	2.47	53.47	48.70
91	1.454	28.546	1094	2.39	53.39	48.79
90	1.409	28.591	1090	2.31	53.31	48.88
89	1.365	28.635	1087	2.23	52.23	48.97
88	1.323	28.677	1083	2.16	53 16	49.07
87	1.282	28.718	1080	2.09	53.09	49.16
86	1.241	28.759	1076	2.02	53.02	49 26
85	1.202	28.798	1073	1.96	52.96	49.36
84	1.164	28.836	1069	1.89	52.89	49.46

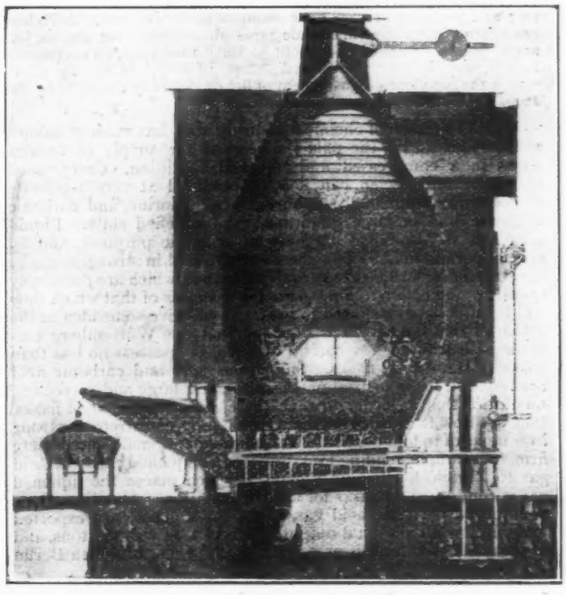
I. Temp. Degrees F	II. Vapor Tension.	III. Gas Pressure —30" = II.	IV. Volume of Unit Weight of Gas (51 pounds.)	V. Weight of Volume (Col. IV.) of Aqueous Vapor in lbs.	VI. Weight of Gas and Vapor —V + 51.00.	VII. Weight of 1,000 cu. ft. Gas and Vapor at Temp. I. and Pressures II. and III.
83	1.127	28.873	1066	1.83	52.83	49.65
82	1.092	28.908	1063	1.77	52.77	49.05
81	1.057	28.943	1060	1.71	52.71	49.74
80	1.023	28.977	1056	1 65	52.65	49.84
79	.990	29 010	1053	1.60	52 60	49.93
78	.958	29.042	1050	1.54	52 54	50.03
77	.927	29.073	1047	1.49	52.49	50.12
76	.896	29.104	1044	1.44	52.44	50.22
75	.867	29.133	1041	1 39	52.39	50.32
74	.839	29.161	1038	1.34	52.34	50.42
73	.811	29.189	1035	1.30	52.30	50.52
72	.784	29.216	1032	1.25	52.25	50.62
71	.758	29.242	1030	1 21	52.21	50 71
70	.733	29.267	1027	1.17	52.17	50.81
69	.708	29.292	1024	1.13	52.13	50.91
68	.684	29.316	1021	1.09	52.09	51.02
67	.661	29.339	1018	1.06	52.06	51.12
66	.639	29.361	1015	1.02	52.02	51.22
65	6 17	29.383	1013	.98	51.98	51.32
64	.596	29 464	1010	.95	51.95	51.42
63	.576	29.424	1008	.92	51.92	51.52
62	.556	29.444	1005	.88	51.88	51.62
61	.536	29.464	1003	.85	51.85	51.72
60	.518	29.482	1000	.82	51.82	51.82
59	.500	29.500	998	.79	51.79	51.92
58	.482	29.518	995	.76	51.76	52.02
57	.465	29.535	992	.74	51.74	52.13
56	.449	29.551	990	.71	51.71	52.23
55	.433	29.567	988	.68	51.68	52.33
54	.418	29.582	985	.66	51.66	52.44
53	.403	29.597	983	.64	51.64	52.55
52	.388	29.612	980	.61	51.61	59.65
51	.374	29.626	978	.59	51.59	52.75
50	.361	29.639	975	.57	51 57	52.86
49	.348	29.652	973	.55	51.55	52.97
48	.336	29.665	971	.53	51.53	53.08
47	.323	29.677	969	.51	51.51	53.18
46	.311	29.689	966	.49	51.49	53.28
45	.299	29.701	964	.47	51.47	53.39
44	.288	29.712	962	.45	51.45	53.50
43	.278	29.722	960	.44	51.44	53.61
42	.267	29 733	958	.42	51.42	53.72
41	.257	29.753	955	.40	51.40	53.82
40	.248	29.752	953	.38	51.38	53.93
39	.238	29.702	951	.37	51.37	54.04
38	.229	20.771	949	.36	51.36	54.16
37	.220	29.780	946	.35	51.35	54.27
36	.212	29.788	944	.34	51.34	54.38
35	.204	29.796	942	.32	51.32	54.49
34	.196	29.804	940	.31	51.31	54.60
33	.188	29.812	938	.30	51.30	54.71
32	.181	29.819	936	.28	51.28	54.82
31	.173	29.827	933	.27	51.27	54.93
30	.166	29.834	931	.26	51.26	55.05

Wilson's Gas Motive Power Plant.

Recent events having brought into prominence the subject of fuel gas production, and the character and merits of the Mond and Duff specialties in this line having been adequately set forth to the industrial public, it will be useful to place upon record the present condition of fuel gas practice according to other systems. It may be as well to recapitulate the special points of the Mond-Duff vartety of fuel gas, which forms a class by itself. Though the gaseous product itself is only a 150-unit fuel gas, like another, it differs from all others in the source of this calorific power. This is chiefly hydrogen, resulting from the decomposition in the producer fire of a large quantity of water. The first and principal object of passing so large a quantity of water through the fire is, as is well known, to wash out of the fuel as much as possible of the ammonia. In order to effect this object, also, a low furnace temperature is desirable. It is further necessary, for the gasification of the large quantity of water, that a very complete arrangement for returning to the producer the sensible heat carried off by its products should be provided. But for this high efficiency of recuperation, the excess of moisture would put out the fire. Mond-Duff gas is consequently a product of a low temperature process of gasification, with excess of water. It contains a very high proportion of the incombustible chimney gases, nitrogen and carbonic acid; and it can only be advantageously made where the coal used is rich in ammonia, recoverable in a marketable form, and where water is plentiful.

Other systems of fuel gas making all belong, without exception, to the high temperature class of producers; and some differ so widely from the Mond-Duff principle as to use no water whatever. The latest Lencauchez plants work with a fan blast, which is a far more economical means of forcing combustion than a steam jet. The product is a gaseous fuel rich in carbonic oxide, but with no hydrogen. It appears to be easily made from the lowest grades of the poor dry-natured coals of the Continent of Europe. One would expect that compressed peat and wood might be amenable to treatment in the same way. The system has its limitations, however, in the practical impossibility of working a strong coal by forced draught, in any depth, without choking the furnace with clinker. Steam was added to the original gas generator furnaces with the double object of reducing the excessive local temperature, and keeping the clinker in a state that made it convenient for removal. The hotter the Siemens type of producer can be worked, the more economical it is as a gas generator, and the better gas it makes.

Many engineers have remained faithful to the high temperature class of gas producer, for various reasons. Prominent among these is Mr. Alfred Wilson, of Stafford, whose producers have been favorably



The Wilson Gas Producer.

known to fuel users these many years past. Mr. Wilson, however, has felt the full force of the revolution that has occurred in connection with the large gas engine; and he now announces his "Gas Motive Power Plant" as confidently as any. This arrangement is a perfectly natural development of the Wilson producer, as originally made for heating kilns, etc. The producer itself is practically unaltered in shape. It is still made to contain a deep mass of fuel, and the depth of the fuel bed has nothing to do with the composition of the gas made. This differentiates the type from the Dellwik and other systems in which the thickness of the fuel bed has a critical value. The Wilson producer has, however, been improved in several important details. The early ones had to be stopped for a considerable period once a day for clinkering, which meant loss of time and of fuel. For 12 years past, a mechanical continuous acting clinkering attachment has been applied to the Wilson producer, consisting of an endless screw working in the mass of clinker and ashes lying in the water ash-pan underneath the hearth. This forces the refuse up an inclined plane outside the producer, whence it drops into trucks or upon a conveyor as the case may be. These worms are made tapering; their largest diameter being at the outside end; and the blades increase in pitch in the same direction. Consequently, nothing sticks in them. The wear and tear of these arrangements is very small; and, owing to the continual agitation of the fuel by the moving worm, the best condition for a uniform production of gas is secured.

During the many years of the successful application of Dowson power gas plant, using always either anthracite coal or coke for driving gas engines of small and moderate sizes, Mr. Wilson appears not to have seen his way to enter this field with his gas producers consuming bituminous slack coal. The reason for this abstention was the small size of the power units, which offered no scope for the elaborate purifying plant necessary in the case of bituminous coal gas. It cannot be too strongly insisted upon that Dowson and other simple gas producers,

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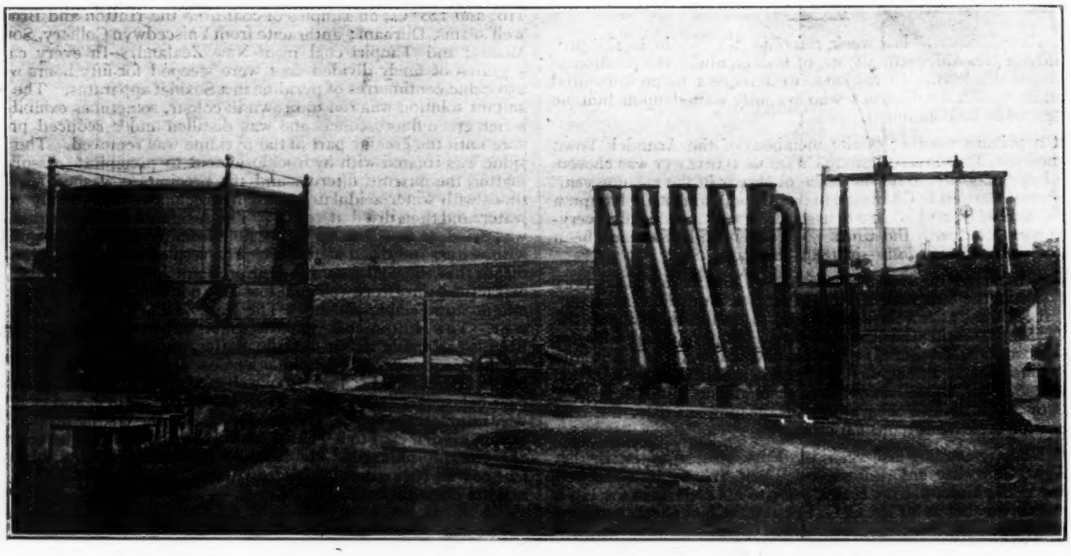
with little or no provision for purifying the gas in any way, are only really satisfactory with the cleanest anthracite; and this is now preferred for their consumption in the grade of "pea anthracite." Gas coke is apt to be too dirty for these plants; and, of course, metallurgical coke is too scarce and dear.

This being the case, the economical aspect of power generation by means of fuel gas was evidently tied to the cost and availability of anthracite. Even so, its cost just equalled that of power generated by the best modern steam engines and boilers; while it was, on the whole, more convenient than the latter. With the enlargement of gas engines, and the heightened appreciation of the advantages of power distribution in factories, which are marks of modern engineering opinion, came the opportunity for adapting to this new demand the much cheaper fuel gas which can be made from bituminous slack coal at only ⅛ the price of anthracite and ¼ the cost of coke. This gas has to be purified; and though the purifying process might even be profitable, on account of the value of some of the matters classed as impurities when they occur where they are not wanted, it could not be properly done on a very small scale.

Obviously, the question of whether or not purification of fuel gas made from bituminous coal pays for itself, is subsidiary to that of whether such gas, residuals apart, can be advantageously used by proper treatment for the purpose in view—namely, the generation by means of gas engines of power on a larger scale than that of the familiar Dowson plant. This major problem was solved experimentally by Mr. Wilson, with 4 years' continuous working of a 150-horse Crossley engine. In the light of the experience gained from this trial, a gas power plant of considerable importance was designed by Mr. Wilson for the Horsehay Company, Limited, Shropshire, where it has been erected by the Company. The accompanying illustration represents



The Wilson Gas Power Plant at the Horsehay Works, Shropshire.

this plant as it stands, having a gas producing capacity equal to about 300 indicated horse power. It consists of one Wilson gas producer with heat regenerator, gas cooling and washing appliances, and a gasholder about 25 feet in diameter. By a system of underground cast iron mains, the gas is distributed from the holder to various engines scattered over the extensive works. Two of the engines, including the largest, of 80-horse power, are by the Stockport Company, the others being Crossley's.

The coal is brought by rail to the charging stage level of the producer; thus saving this labor. The producer is blown by a small Root's blower; but before entering the producer, the air, along with a certain volume of added waste steam, passes through the cast iron pipe regenerator which in the picture stands on the right and nearly hides the producer. The gas issues from the latter at a temperature of 800° to 1,000° F., and by means of this piece of apparatus much of this sensible heat is transferred to the air and steam. Between the producer and the regenerator is an automatic check, so that while air can always go forward, gas can never return. Thus the formation of an explosive mixture when the producer is stopped is prevented. The gas is next passed through an annular air surface condenser (shown in the picture) where it is reduced to atmospheric temperature. It then passes through a washer, and finally through a sawdust check box into the gasholder. There are the usual tar and liquor drain pipes, seals and wells. One man attends to the producer and the whole of the plant. Very little water is used; the object being to avoid loading the gas with aqueous vapor.

In continuous working, the power generated in this kind of plant is remarkably cheap. The fuel consumption works out to about 1 pound of slack coal per indicated horse power per hour. With coal at 7s. 6d. per ton, labor, capital charges, water and stores, the cost is 10s. per ton of coal gasified, representing 2,000 indicated horse power hours, or 0.06d. per I.H.P. hour.

The gas shows a calorific power of from 149 to 150 British thermal units per cubic foot. The system was installed under the careful supervision of Mr. H. C. Simpson, Managing Director of the Horsehay Company, who decided in favor of this method of power generation and distribution after a very thorough consideration of its merits as compared with central station electricity generation and electric motors in the various shops. Small gas engines are almost as efficient as large ones; and there is no loss through pipe distribution. Thus the loss of efficiency by the double electric transformation through dynamo and motor is saved. The separate gas engines cost about the same as separate electric motors; so that there is nothing to gain or lose in this way. Inasmuch as the Horsehay Company, who are large iron and steel bridge builders, have on their works electric power and light, hydraulic power, pneumatic power, and now possess a very complete system of gas power, they must be credited with knowing as much as is necessary about all these different forms of power; and the fact of their latest advance being an installation of gas power should be regarded as a handsome testimonial to its merit. The only point of weakness we can see in this plan is the amount of ground space occupied by it, which seems considerable. Of course, where there is ample room and to spare, this consideration does not matter; but the plant strikes one as being rather bulky for its power, to say nothing of the accessary boiler, which would be necessary if waste steam were not available. We are indebted to Mr. Wilson for the particulars upon which this article is based.

Russian Coal.

Engineering, of London, says that the temporary remission of the duty on coal imported into certain parts of Russia is a clear proof that, from one cause or another, the domestic supply is unequal to the demand. As a fact, Russia is and for long has been a large importer of English coal, and the invitation to bring it in free of duty is an obvious comment on the shortage of the native article. Certainly, the quantity that may be imported and the places of consumption are dictated; but a Government that is above all solicitous for the protection of its own industries would not permit the introduction of any imports on these easy terms were the necessity not very great. Even now, when depression reigns in many manufacturing centers, the duties are remitted only in approved cases. Last year, when trade was very active, there was a

coal famine in the country, and not only were the duties suspended, but other encouragements were given to the importation of the foreign article. It seems odd at first thought that these conditions should exist in a country boasting of a coal bearing area next only to China and the United States and which can show all varieties of fuel. But the empire is very extensive, and though coal is found in many parts, it is mined on a large scale in only 2 localities—South Russia, which produced 691,500,000 poods out of last year's aggregate of 985,200,000 poods; and Poland, which produced 250,700,000 poods. In the Urals 22,500,000 poods were obtained, and in the Moscow basin 16,700,000 poods; the Caucasus bringing up the rear with 3,800,000 poods. Seeing that Lodz and Warsaw, in Poland, are among the centers recently permitted to receive foreign coal duty free, it is a fair inference that the Polish supply is inadequate. After all, 250,700,000 poods is only equal to a little more than 4,000,000 tons, and that quantity will not go very far in such busy centers of textile and other manufacturing activity as these. The Donetz basin, in South Russia, is equal to a much greater production than at present, but it is remote, and not much of its coal goes north, because the cost of carriage is high in spite of the railway facilities granted. Poland can be better supplied from Prussia, and the northern parts of the empire from Great Britain. By the same token, English coal has now lost a good part of its outlet in the Black Sea, and Donetz coal has even been sent beyond the Bosphorus. As far back as 1892, Mr. P. Stevens, the English Consul at Batoum, pointed out that foreign coal had been superseded in that market by coal from the Caucasian fields and the basin of the Don, both of which are inferior in quality to English coal, but which can be sold at a trifle under the prices that English coal fetched. But in the Baltic it is not easy to see how English fuel is going to be supplanted by Russian.

It is possible that, when the Donetz coal fields have been further developed, we shall see more competition with English fuel in the Mediterranean. These fields are more than equal to the demands of the iron and other works which have been established in South Russia in recent years. They cover an area of fully 20,000 square versts, and one of their features is the variety of the fuel produced—from soft coal to anthracite. The latter, however, is not very plentiful, and the output has shown a very marked decrease in recent years. Of bituminous fuel, this part of Russia contains an untold wealth. In the western portion alone, in the Government of Ekaterinoslav, 45 workable veins have been discovered, having a total thickness of 112 feet, and about 415 milliards of poods awaiting exploitation. The eastern area is even richer. The extension of railways during the last quarter of a century has opened up this field very effectually, and has not only made a South Russian iron industry possible, but, as we have seen, has permitted exportation to the Mediterranean. The capabilities of the Donetz mines are checked by the limited market. The iron works are the best customers; and the big consuming centers of the North are too remote to permit of large shipments. Still the Donetz is not badly off. The Koslov-Veronezh-Rostov Railway connects the anthracite mines of Zisichousk, in the eastern portion of the basin, with the general network of Russian railways, and considerable quantities go that way into the interior. By means of the Kharkov-Nicolaiev and Lozovo-Sebastopol railways the Black Sea ports are made accessible; and the connection of the fields with the iron ore deposits of the Krivoy-Rog by means of the Ekaterininsk railway is fraught with vast possibilities of expansion to both the iron and the coal interests. The railways themselves are good customers, for they take not much less than one-third of the whole output. The Moscow coal region is 400 miles long and over 270 miles wide, extending over the Governments of Tver, Moscow, Kalouga, Tula, and part of the Governments of Novgorod, Smolensk, Riazan, Vladimir and Tambov. Few mines are producing now in this locality; the quality of the coal is not good, and the cost of working is high, for the colliers find it difficult to compete with Donetz coal. The so-called Polish basin is situated at the southwestern corner of Poland, and embraces a portion of the Bendinsk district of the Government of Petrokov, and of the Olekoushsk district of Kelitz. It is a continuation of the so-called Polish-Silesian basin. The area of the entire basin is about 2,600 square miles, of which 1,800 are in Prussia, 450 in Austria, and about 350 in Poland. The portion worked for coal covers about 900 square miles, of which 400 are in Prussia, 300 in Austria, and 200 in Poland. The seams and the quality of the coal are not uniform. In Poland, the Reden seams—the middle of three groups, and known in Germany as the Sättel-Flötz—have a thickness running from 28 feet to 49 feet; but as they extend westward, the vein is divided by interlayers of dirt, first into two, then into three, and lastly into four separate seams. At the western extremity, near Zabrzhe, the Reden group contains coking coal, and the lower seams of the upper group give gas fuel. Nearer to the Polish frontier the Reden coal is no longer coking, but it is still serviceable for gas making. In Poland the Reden and overlaying seams give neither coking nor gas coal. Until within very recent years the exploitation of coal in Poland was conducted on the old, easy, but wasteful, plan of letting the roof fall in. But the thickness of the seams led to many accidents, and naturally there was enormous wastage. Moreover, the disintregation of portions of the seam and the spontaneous combustion of coal led to numerous fires. Present methods approximate more nearly to the modern, but they are not all that might be desired.

Coal formations occur on both sides of the Urals. On the western side they form an almost uninterrupted band, extending along the greater portion of the strata. On the eastern slopes the occurrences are generally in small, narrow and interrupted bands and patches, sometimes jammed between massive crystalline rocks. In their mode of stratification the coal measures of the Western Urals present close similarity to those of the Moscow district. The coal is poor. On the eastern side the most important coal bearing area extends for a distance of about 70 miles towards the south; the more northern deposits containing poor, soft coal and some anthracite, and the southern coking coal. The railways, iron and salt works are the best customers, and a small quantity goes down the Kama.

In Western Siberia the only district that is extensively worked for coal is Kusnetsk, in the southeastern corner of the Government of Tomsk, between the Salairsk and Altai mountain ranges. The field is divided into two parts by the River Tom; it is 280 miles in width and 70 miles in length, or about 19,600 square miles in area. This locality does not contribute much to the needs of the country. It is remote from the big centers of consumption, and the local demand is not considerable. The Siberian railway promises to be a customer in the future, but the coal is not of very attractive quality.

The great railway ought to do something for the development of coal production in Siberia. It will be remembered that the commission appointed to study the economic geology of the country along the line of the railway turned its attention first of all to the coal deposits, with a special eye to the fuel requirements of the road, and it was prompt in locating about 50 groups of workable coal or lignite beds. In Western Siberia, between the Ural and Altai chains, there are no coal or petroleum deposits along the railway, while timber is scarce. The commission, therefore, organized explorations on a large scale, extending to the shores of the Okhotsk Sea. On the Kirghiz Steppes coal of good quality was found at Djaman-Taou and at Taldyskoul. The coal of these districts may be conveyed by the Irtish and Ichin rivers to Omsk and Petropaulosk, important stations on the Siberian railroad. In the Yenisei basin there are numerous deposits, especially in the valley of the Yenisei river, not far from Krasnoyarsk, where the lignites of tertiary formation commence, a better coal being found along the banks and at the mouth of the lower Tounjouskat. Large deposits of free burning lignite occur in seams of 6½ feet thick along the banks of the Oka, a tributary of the Angara, especially near the confluence of the Zima. Coal is found at several points on both slopes of the Baikal chain, especially in the Angara valley, to the north of Yakutsk. Seams also occur on the southwest shore of Lake Baikal, at the mouth of the Mourine, and in other places. The Amour valley, and those of several of its tributaries, are rich in coal.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

It is said that the proprietors of the Syracuse (N. Y.) Lighting Company, now that they have completed the reconstruction of the electric division of their properties, propose to reconstruct the gas plant. General Manager Cummins will likely make no objection to the consummation of the rehabilitation scheme.

We are indebted to a correspondent in Omaha, Neb., for the following squib: "Because a gasholder in his neighborhood makes a rasping and screeching noise as it moves up and down, one Frederick Schlemme, living at 1915 Lincoln avenue, Omaha, has begun suit against the Omaha Gas Company for $2,000 damages. He avers that the peace and quiet of his home are disturbed by day as the holder rises from its watery bed to take in the illuminating vapor, and again in the night time, when he and his family are wont to woo Morpheus, the holder cheats them out of their rest by a continuous groaning as it squeezes out the gas."

Mr. David Leavitt Hough has completed, to the entire satisfaction of Mr. Frank D. Moses, Chief Engineer of the South Jersey Gas, Electric and Traction Company, the sub-aquous connection under Cooper's

Creek which insures a gas supply between the East and West sides of Camden, N. J.

THE authorities of Clinton, Ills., have authorized the Clinton Gas Company to maintain on public account in the streets 101 arc-electric lamps, of 1,200-candle power each, for the sum of $6,000. The contract is to run for one year, and the service is to be on the moontable schedule.

ACCORDING to the official figures the output of the People's Gas Light and Coke Company of Chicago, for the 9 months ended September 30th, 1901, was 5,435,971,990 cubic feet. During the same period the Company's gross income from all sources was $6,728,594.

MR. J. D. BREWER has applied to the authorities for the right to construct and operate a gas works in Albion, Nebraska.

MR. BENJAMIN M. WEIL. Vice,President of the Milwaukee (Wis.) Gas Light Company, died suddenly at his home, 286 Knapp street, Milwaukee, the evening of October 25th. Deceased, who was born in Baltimore, Md., May 4, 1850, settled in Milwaukee in 1874, and engaged in a small way in the fire insurance business. Later on his prosperity brought him into the front ranks of the business men of Milwaukee. At a special meeting of the Directors of the Milwaukee Gas Light Company, convened for the purpose of making a suitable minute to the memory of Mr. Weil, the following action was taken:

"*Whereas*, The Board of Directors of the Milwaukee Gas Light Company learned with regret and sorrow of the death of their Vice-President, Benjamin M. Weil, and desire to place upon record their appreciation of his worth as a citizen and officer of this Company, and as a man, therefore,

"*Resolved*, That in the death of Benjamin M. Weil this Company has lost an able, efficient and conscientious official, and his death has removed from our midst a citizen who was held in the highest esteem, and that those with whom he had business relations will feel his taking off as a personal bereavement.

"*Resolved*, That a copy of these minutes be sent to his family.

"SHELDON J. GLASS, Secy."

"THE Minneapolis (Minn.) Gas Light Company will the coming spring extend its main system to the outlying district of the city known as New Boston. Secretary Levings has favored this extension for some time, and it is likely his persistence in the premises that finally opened the eyes of the Directors to the profit that seems to be in the proper working up of the New Boston field.—A. L. W."

CERTAIN capitalists of Keene, N. H., have acquired control of the Leominster (Mass.) Gas Light Company. Quite probably the new owners propose to consolidate the gas and electric lighting interests of Leominster.

THE new holder for the Meriden (Conn.) Gas Light Company, which was constructed by Messrs. Bartlett, Hayward & Co., is working to the complete satisfaction of Superintendent Learned. The capacity of the vessel is 700,000 cubic feet. By-the-way Mr. Learned's intelligent methods of conducting operations at Meriden are bearing good fruit, for the clever gentleman recently admitted within the hearing of the writer that the Company's output for September, 1901, exceeded that for September, 1900, by a trifle over 20 per cent.

MANY comments in favor of the exhibit made by the H. Mueller Manufacturing Company, of Decatur, Ills., in Parlor "K.," of the Hotel Brunswick, Boston, Mass., during the meeting of the American Gas Light Association, were made. The display consisted of a well arranged selection of pipe tapping machines, gas cocks and meter connections, the many styles of which are shown in the Company's new catalogue, No. 3B. The souvenir distributed this year by the Mueller folks was a handsomely plated adjustable wrench, of more than miniature size.

THE Morris Gas and Fuel Company, to operate in Morris, Ills, has been incorporated by Messrs. Joseph H. Pattison, Edward L. Clover and Ole Erickson. It is capitalized in $25,000.

THE stockholders of the Universal Conduit, Light, Heat and Power Company, of Wilmington, Del., will hold a special meeting on the 25th inst. to consider a plan for the absorption of the properties of the Wilmington Coal Gas Company.

THE plant of the Everett (Wash.) Gas Company has been completed, and is now in satisfactory operation. The speed with which the construction work at Everett has been carried on is a right good testimonial to the careful planning of Mr. C. R. Collins.

THE gas rate at Haddonfield, N. J., under the new contract between the authorities of that place and the proprietors of the South Jersey Gas, Electric and Traction Company, has been reduced to $1.25 per 1,000 cubic feet.

"T. W." is informed that the last regular quarterly dividend of 2½ per cent. on the shares of the Municipal Gas Company, of Albany, N. Y., was declared October 19th, and made payable the 1st inst.

ACCORDING to the reports rendered to the city authorities of Philadelphia, for the quarter ended September 30th, by the United Gas Improvement Company, it is shown that the Company sold 871,615,700 cubic feet of gas.

A CONTROLLING interest in the Riverside (Cal.) Gas Company has been sold to Mr. Herbert C. Brown, of Los Angeles, Cal.

THE Fredonia Gas Company, to supply either artificial or natural gas to the residents of Fredonia, Kansas, has been incorporated. It is capitalized in the sum of $65,000.

COL. MELVILLE M. GILLETT, of Columbus, O., has been appointed Treasurer and Manager of the Newark (O.) Gas Light and Coke Company.

MR. E. F. GALLAGHER, Vice-President and General Manager of the Traverse City (Mich.) Gas Company, writing to the JOURNAL, says:

To the Editors AMERICAN GAS LIGHT JOURNAL: I take pleasure in saying to you that the Traverse City Gas Company is doing active business. Owing to trouble with the City Fathers over the use of the streets rather than the alleys in which to lay our mains, we commence with a comparatively small distributing system. We brought mandamus proceedings against the Mayor and Board of Aldermen to define our rights in these respects under the franchise granted, and the decision was against us; but we shall appeal to the Supreme Court. I forward you a copy of the decision. The officers of the Company are: Directors, H. B. Webber, E. F. Gallagher and C. D. Ransom, of Ionia, Mich., and G. H. Russell and F. Osburn, of Detroit; President, H. B. Webber; Vice-President and General Manager, E. F. Gallagher; Secretary and Treasurer, C. D. Ransom; Superintendent, T. A. Bates.

THE decision in the Traverse City case, which was in the nature of mandamus proceedings instituted by the Company against the authorities, and tried before Judge Mayne in the Circuit Court, is as follows: "Relator seeks to compel the respondent to approve certain plans to permit the use of the streets designated in its application for laying gas mains. It is agreed by counsel that the entire relief prayed must be granted or the writ denied. Application was made to the city to approve its plans and permit the use of the streets designated therein. Prior to the date of the presentation of said petition the city had adopted a plan covering practically the same territory. Relator's plan is distinctively a street, while that presented by the city is practically an alley system. The rights of the parties depend upon the construction to be placed upon Sec. 7 of the ordinance providing for the establishment of the gas works which reads: 'Said main pipes shall be laid in the alleys whenever practicable and when so ordered by the Council.' No question is raised but that the city has full control over the alleys. To entitle the relator to the relief asked it is not enough to show that its plan is superior to that of the city, but it must show that it is not practicable to lay its pipes in the alleys. Taking into consideration the territory embraced in relator's plan to grant the relief prayed would be practically to strike sec. 7 from the ordinance. The jury finds that all the alleys intersecting Union street on the south side are as well adapted to the use of relator as the streets paralleling them. The same fact is found in relation to nearly all the alleys on the east side. The additional cost of construction of the city's plan over that of relator found by the jury was caused by duplicating the Union street main and the unfavorable condition existing in the alley found not to be practicable. Under the finding of the jury mains might be laid in the alleys intersecting Union street and used in connection with a main laid in said street without any additional expense excepting that arising from the increased length of the service pipe. The same is true of many of the alleys on the east side. At the time of the passage of the ordinance by the Common Council and its acceptance by the relator, both parties contemplated the use of the alleys when practicable. As it was equally apparent to the relator then as now that placing the mains in the alleys would result in additional cost, it cannot now urge this fact as a reason why it should not make use of the same when otherwise equally as well adapted as the streets. In suggesting the use of the alleys in connection with the main laid in Union street, we do not desire to be understood as determining whether it would be practical to lay mains in Bohemia street and the alley east of Union street instead of Union street. Whether mandamus is a proper remedy is not determined. Writ is denied."

MR. W. C. HOLT, of Montgomery, Ala., has purchased a controlling interest in the properties of the Eufaula (Ala.) Gas, Electric Light and Power Company.

CLEVELAND, Ohio, seemingly desires an official inspector of public lamps, etc.

The Market for Gas Securities.

The weakness in Consolidated gas is even more pronounced than at time of last writing. To-day (Friday) the closing was made at 213½ to 214½. The trading, so far as volume is concerned, was light, and no investment stock has been put on the market. Nor can any good business reasons be advanced for the decline, as the Company's output is to a point that taxes the resources of its plants. It is possible that the scalpers are playing it for the decline, which would look the part of foolhardiness. City gas bonds hold up fairly well.

Brooklyn Union quotations are altogether nominal. That Company, however, was never in better financial condition. The regular quarterly dividend of 1½ per cent. on the shares of Peoples gas, of Chicago, was declared today. Baltimore Consolidated is weak, without any seeming good reason therefor. Quite a local demand for Louisville (Ky.) gas is reported. The increase in its output is sufficient cause for the inquiries concerning it.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 Wall Street, New York City.

November 4.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	213½	214½
Central Union, Bonds, 5's.	3,000,000	1,000	109	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	298	302
" Bonds	1,500,000	1,000	00	102
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	107	107½
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River.. Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000		109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	130	135
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	118	..
Yonkers	299,600	500	120	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	204	210
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	⅜	1
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works,	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	95	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	6	7
" " Bonds, 5's	5,250,000	1,000	69	72
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	104¼	104¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,780	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	61½	62
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	14
" Con. Mtg. 5's	880,000	1,000	79	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	53	55
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	60	66
" Bonds, 6's	2 650,000	..	99½	101½
Jackson Gas Co	250,000	50	67	70
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	92½	95
Preferred	2,500,000	100	100	.
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	103½	103¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	

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GAS ENRICHERS.

Standard Oil Co., New York City 741
The Sun Oil Co., Pittsburgh, Pa 751

COKE CRUSHERS.

C. M. Keller, Columbus, Ind 751
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STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y 741
The Connersville Blower Company, Connersville, Ind. 739

GAS GAUGES.

The Bristol Co., Waterbury, Conn 750

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 749
Isbell-Porter Co., New York City 754
R. D. Wood & Co., Phila., Pa 754

CEMENTS.

C. L. Gerould, Galesburg, Ills 748

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J 748
Adam Weber Sons, New York City 748
Laclede Firebrick Mfg. Co., St. Louis, Mo 748
Cyrus Borgner, Phila., Pa 748
James Gardner, Jr., Co., Pittsburgh, Pa 748
Henry Maurer & Son, New York City 748
Baltimore Retort and Firebrick Co., Baltimore, Md 748
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 748
Brooklyn Firebrick Works, Brooklyn, N. Y 748
Missouri Firebrick Co., St. Louis, Mo 748

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Fred. Bredel, Milwaukee, Wis 742
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Logan Iron Works, Brooklyn, N. Y 756
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CHIMNEY CONSTRUCTION.

Adam Weber Sons, New York City..... 749

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Welsbach Company, Gloucester, N.J..... 746
General Gas Light Company, Kalamazoo, Mich..... 746
D. M. Steward Mfg. Co , Chattanooga, Tenn..... 741

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Wm. M. Crane Co., New York City..... 741
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 741

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STREET LAMPS.

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Thos. T. W. Miner, New York City..... 737

PURIFIERS.

R. D. Wood & Co., Phila., Pa..... 744
Stacey Mfg. Co., Cincinnati, O..... 738

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Continental Iron Works, Brooklyn, N. Y..... 754
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The Western Gas Construction Co., Fort Wayne, Ind.... 760
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 752
The Kennedy Valve Mfg. Co., New York City..... 741

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R. D. Wood & Co., Philadelphia, Pa..... 754
Logan Iron Works, Brooklyn, N Y..... 756
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 758

STORAGE TANKS.

Christopher Cunningham, Brooklyn, N.Y..... 740

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The J. Dobson Good Audit Company, New York City.... 737

INVESTORS.

W. R. Faben Construction Company, Toledo, O.. 736

DIVIDEND NOTICE.

OFFICE AMERICAN LIGHT AND TRACTION CO., JERSEY CITY, N. J., October 22, 1901.

The Board of Directors has this day declared a quarterly dividend of 1¼ per cent. for the quarter ended September 30, 1901, on the preferred stock of the Company, payable December 2, 1901, to preferred stockholders of record at the close of business on November 9, 1901, at which time the transfer books of the preferred stock will close and will remain closed until December 3, 1901. Checks will be mailed.

1377-3 EMERSON McMILLIN, President.

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BY A PRACTICAL YOUNG MAN, 27 years of age. Understands laying mains and services, reading, setting and repairing meters, connecting gas stoves, making connections, gasfitting, and all kinds of complaint work, adjusting all kinds of gas appliances. Is competent in the manufacture and distributing divisions of gas works.

Address, "H. L. D.,"

1378-1 Care this Journal.

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By a progressive young man, thoroughly experienced in every department of the business. Have always gotten excellent results in manufacturing department. Capable of operating a works on the modern basis of economy, and can instil the necessary energy into the hunt for new business. Good record, and references of the best.

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Who understands the gas business in every detail, from its manufacture to the office work. Has managed the affairs of his present company 11 years. Will be open for engagement after January 10th, 1902. References furnished.

1378-1 Address, "M.," care this Journal.

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As Superintendent or Assistant

In coal, water or oil gas works. Has practical experience in construction, manufacture and distribution for 20 years. Best of references. Address, "PROGRESS,"

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By a man of 12 years' experience in all branches of the gas and electrical business. Has rebuilt several gas and electric works, including the mains of the gas works and the steam plants of the electric works. Has been with his present company for 5 years as superintendent. Reasons for changing are the best. Best of references given from all former employers. Will be open for position after Nov. 1, 1901. No objection to going to foreign country.

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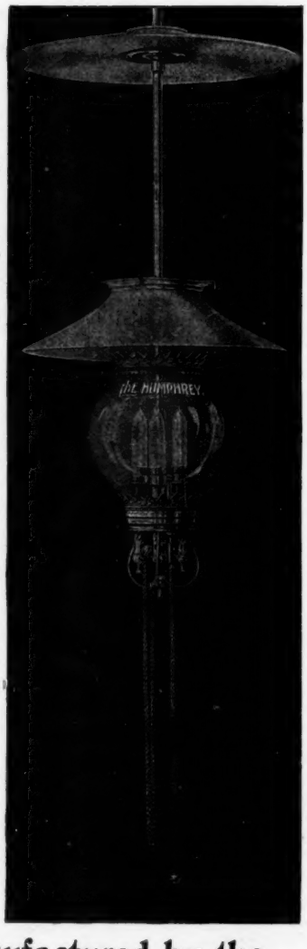

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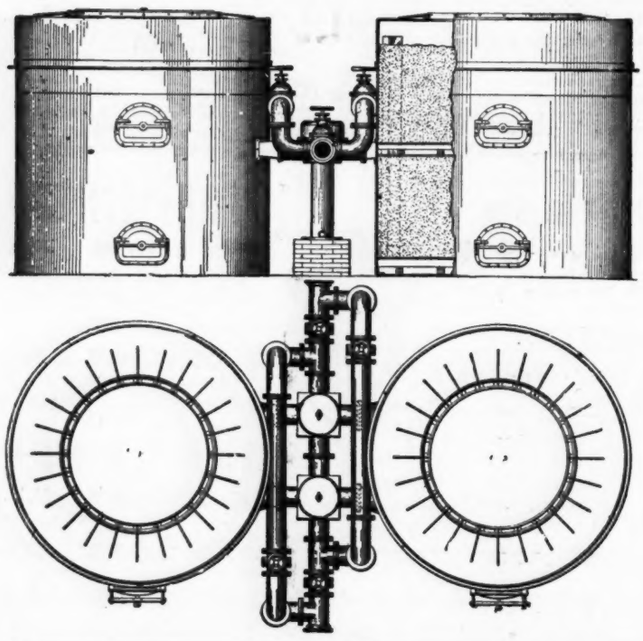

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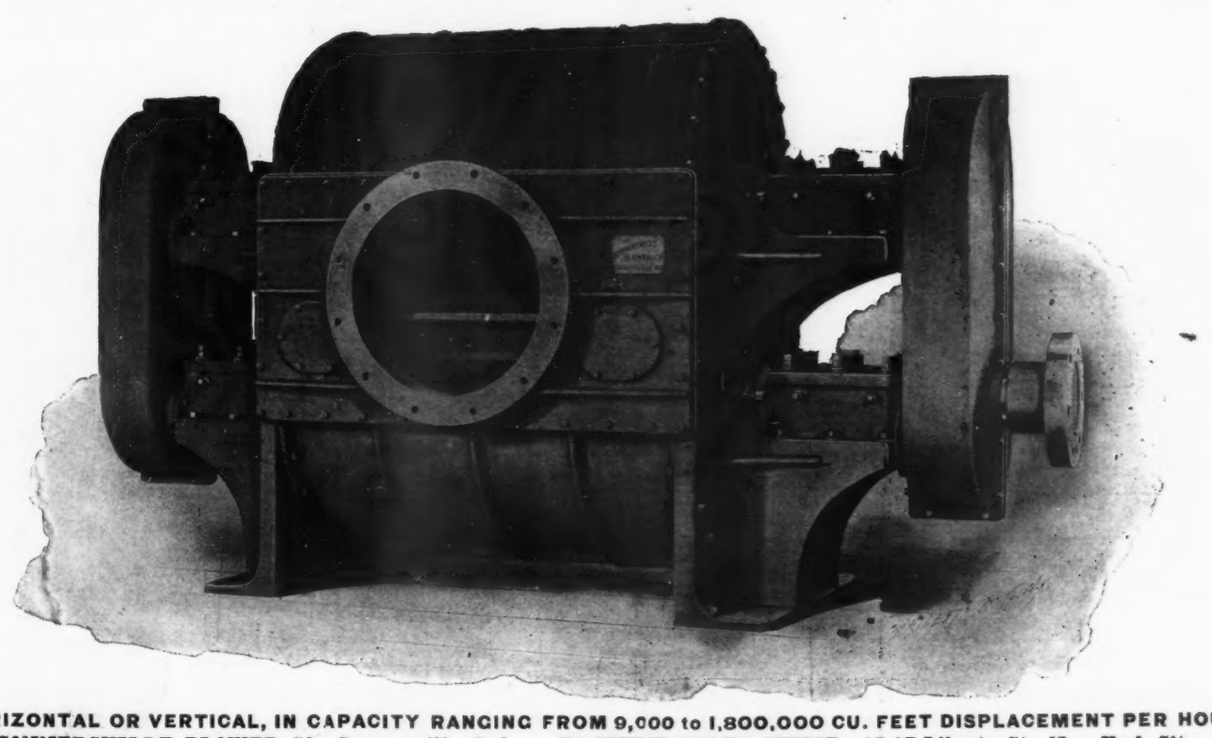

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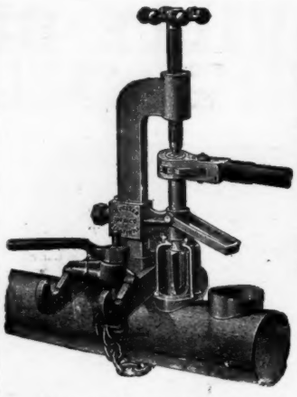

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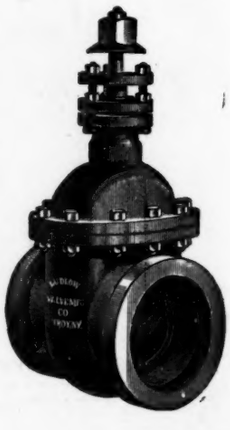

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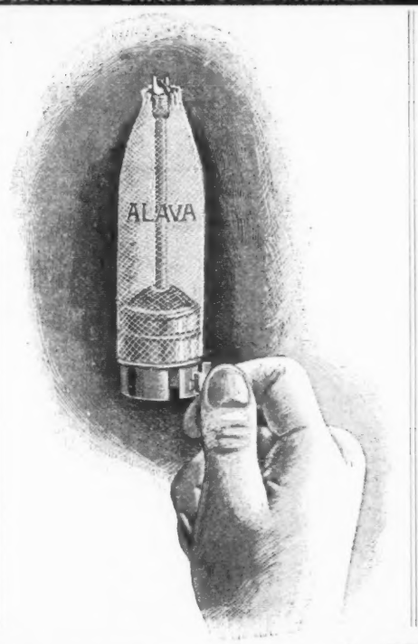

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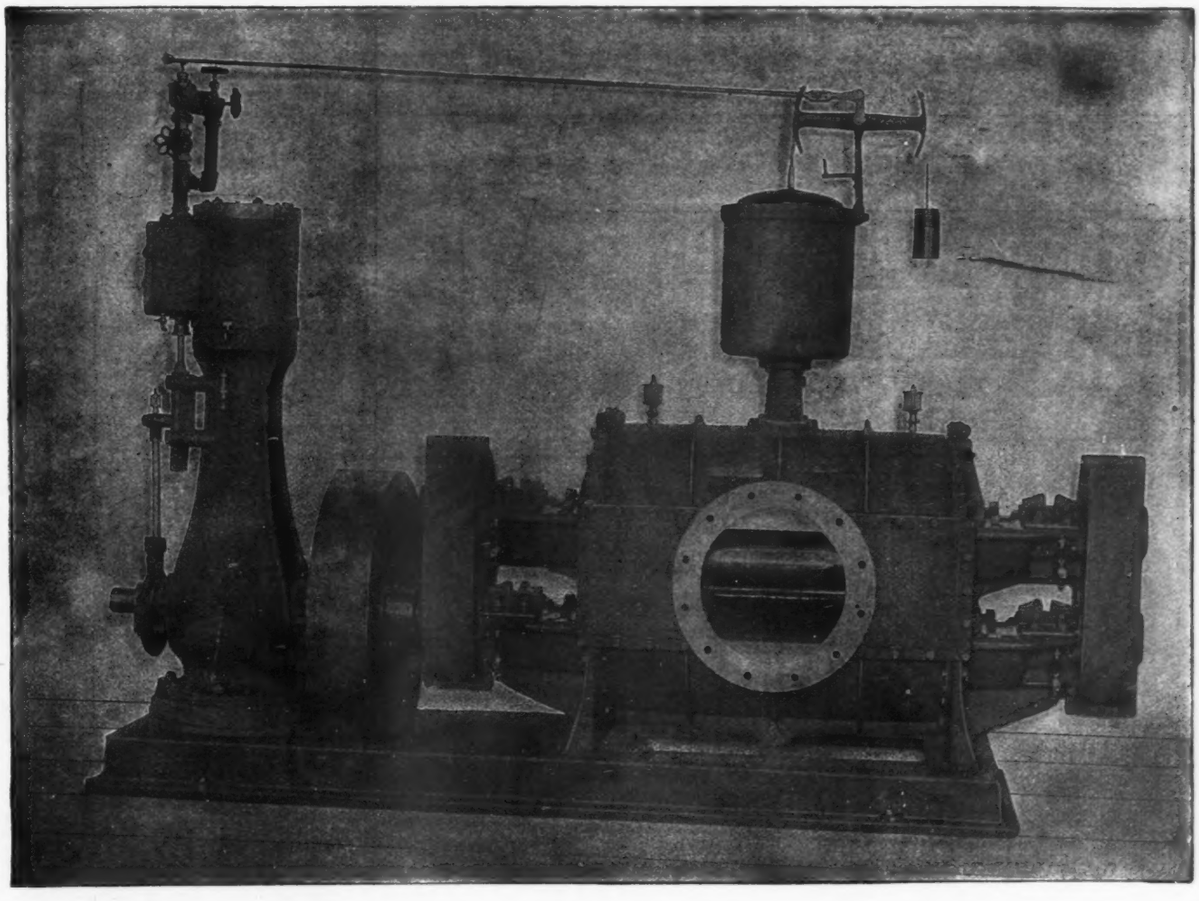

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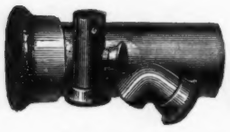

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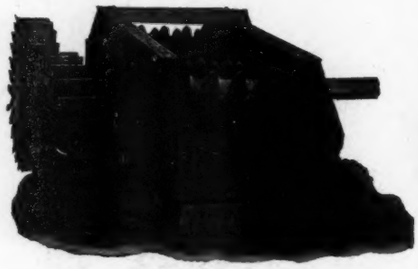

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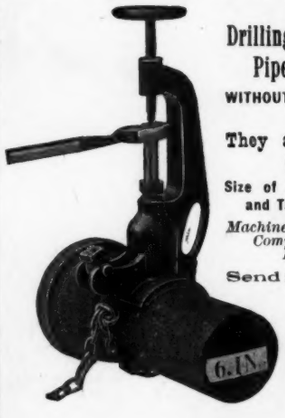

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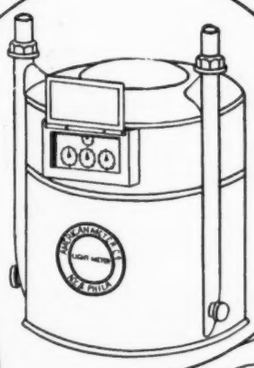

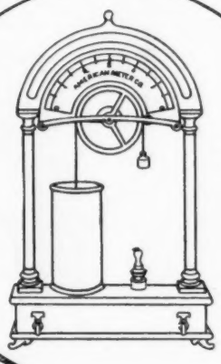

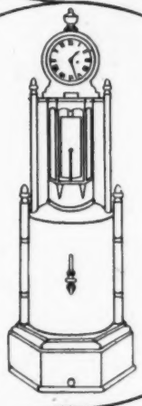

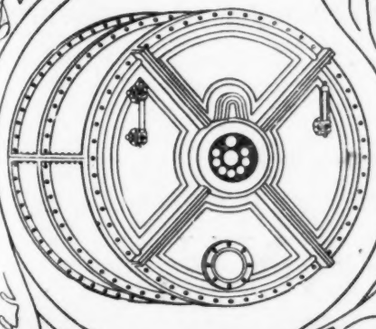

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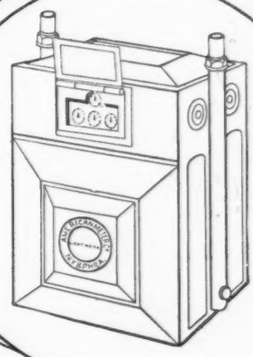
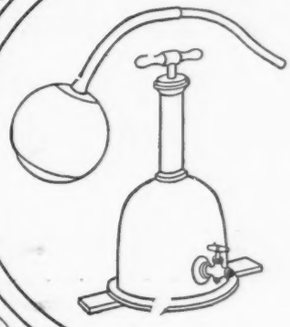
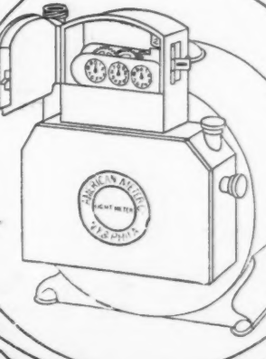






PUBLIC LIGHTING TABLE.

NOVEMBER, 1901.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Fri.	1	5.30 PM	11.00 PM	4.45	5.35
Sat.	2	5.30 LQ	12.00	4.45	5.35
Sun.	3	5.20	1.10 AM	4.45	5.35
Mon.	4	5.20	2.10	4.45	5.35
Tue.	5	5.20	3.10	4.40	5.45
Wed.	6	5.20	4.10	4.40	5.45
Thu.	7	5.20	5.40	4.40	5.45
Fri.	8	5.20	5.40	4.40	5.45
Sat.	9	5.20	5.40	4.40	5.45
Sun.	10	5.20 NM	5.40	4.40	5.45
Mon.	11	5.20	5.40	4.40	5.45
Tue.	12	5.20	5.40	4.30	6.00
Wed.	13	5.20	5.40	4.30	6.00
Thu.	14	5.20	5.40	4.30	6.00
Fri.	15	7.20	5.40	4.30	6.00
Sat.	16	8.20	5.40	4.30	6.00
Sun.	17	9 20	5.50	4.30	6.00
Mon.	18	10.20 FQ	5.50	4.30	6.00
Tue.	19	11.20	5.50	4.25	6.00
Wed.	20	12.30 AM	5.50	4.25	6.00
Thu.	21	1.40	5.50	4.25	6.00
Fri.	22	2.50	5.50	4.25	6.00
Sat.	23	4.00	5.50	4.25	6.00
Sun.	24	No L.	No L.	4.25	6.00
Mon.	25	No L. FM	No L.	4.25	6.00
Tue.	26	No L.	No L.	4.20	6.10
Wed.	27	5.10 PM	7.30 PM	4.20	6.10
Thu.	28	5.10	8.40	4.20	6.10
Fri.	29	5.10	9.50	4.20	6.10
Sat.	30	5.10	10.50	4.20	6.10

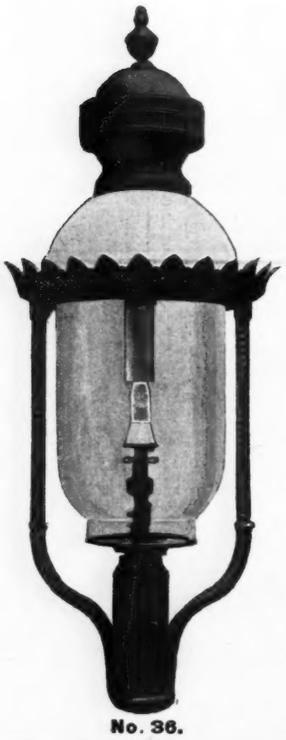
TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45

NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

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IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

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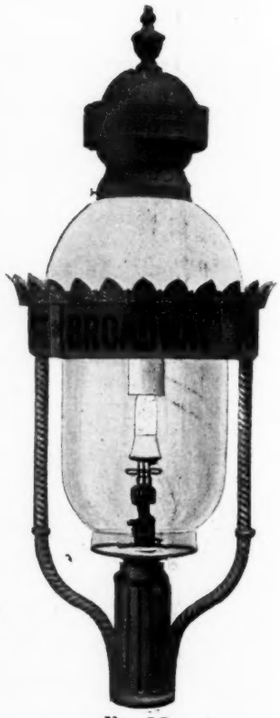

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The most practical, efficient and artistic burner yet produced. . . . . .

It contains an improved adjustable Bunsen so constructed as to permit of a wide range of variations in gas pressure without blackening the mantles and without an adjustable air shutter. . .

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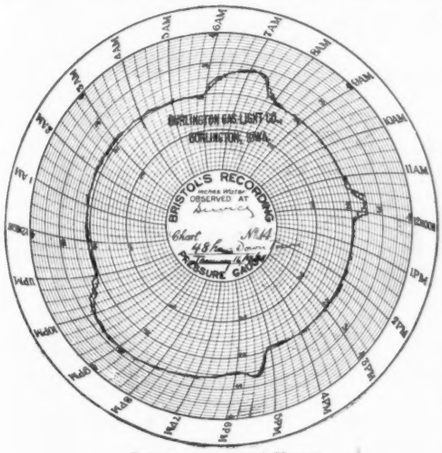
Particularly a CONNELLY Gas Governor,



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Is as essential to the operation of a gas works as the Governor of any of our great States is necessary to the successful working of one of these political bodies.

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Mr. Clary is only one of scores of gas managers who find Connelly Governors absolutely indispensable. We are in business to give you all the information you can wish about Governors.

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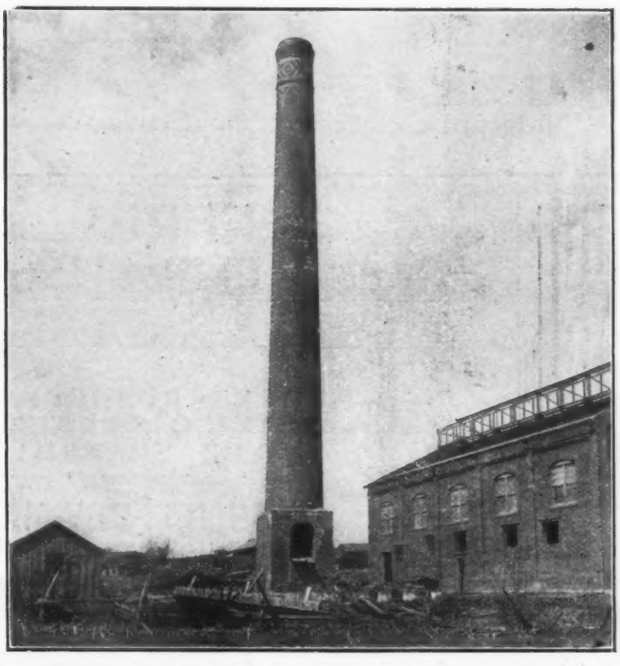
Designers and Builders of Chimneys of Perforated Radial Bricks.



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Adam Weber Sons, 633 E. 15th St., N. Y. City—Gentlemen: It is a pleasure for us to state that the chimney built for us by you, at the works of the Nazareth Cement Co., at Nazareth, Pa., is an exceptionally fine one. We are certainly pleased with the workmanship on the same, and feel that there is no finer chimney anywhere if construction is considered. Yours very truly,

H. P. HAMPSON,
General Manager New England Engineering Company, at Nazareth, Pa.

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The Gas Engineer's Laboratory Handbook,

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Carefully prepared.
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Write for Descriptive Pamphlet and prices before ordering elsewhere.

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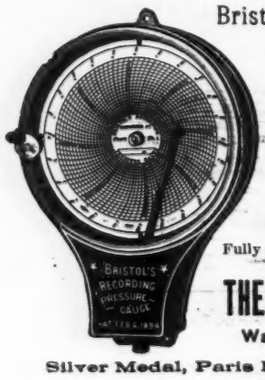

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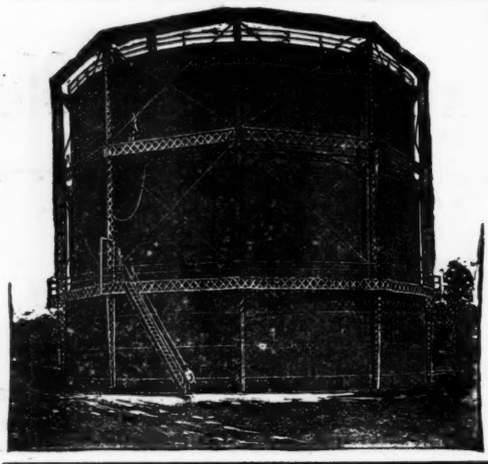

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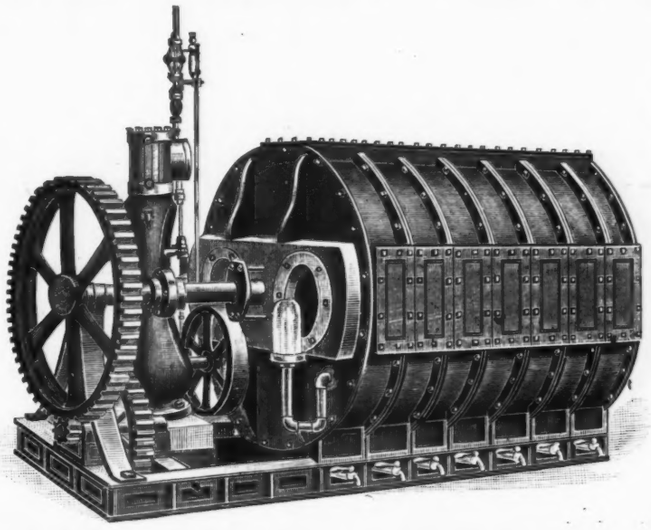

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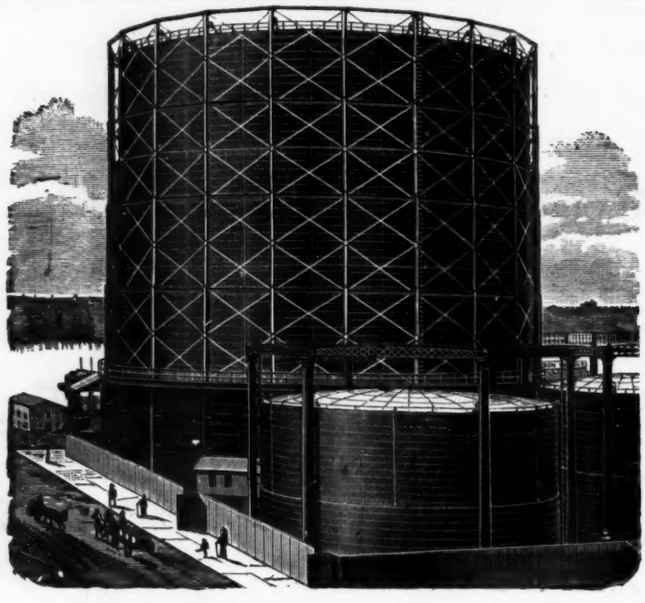

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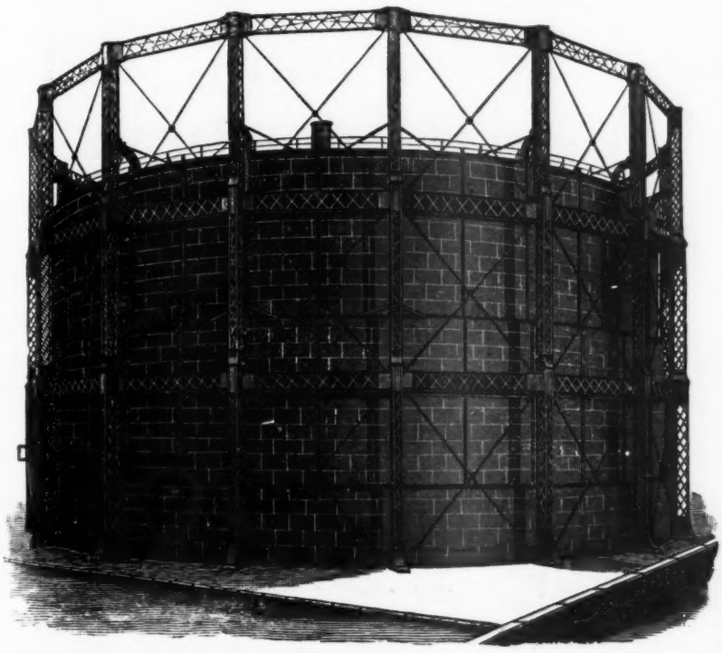

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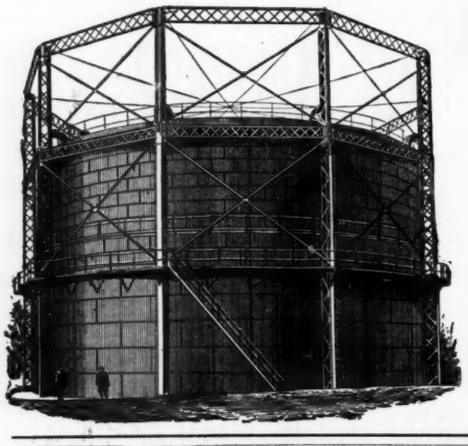

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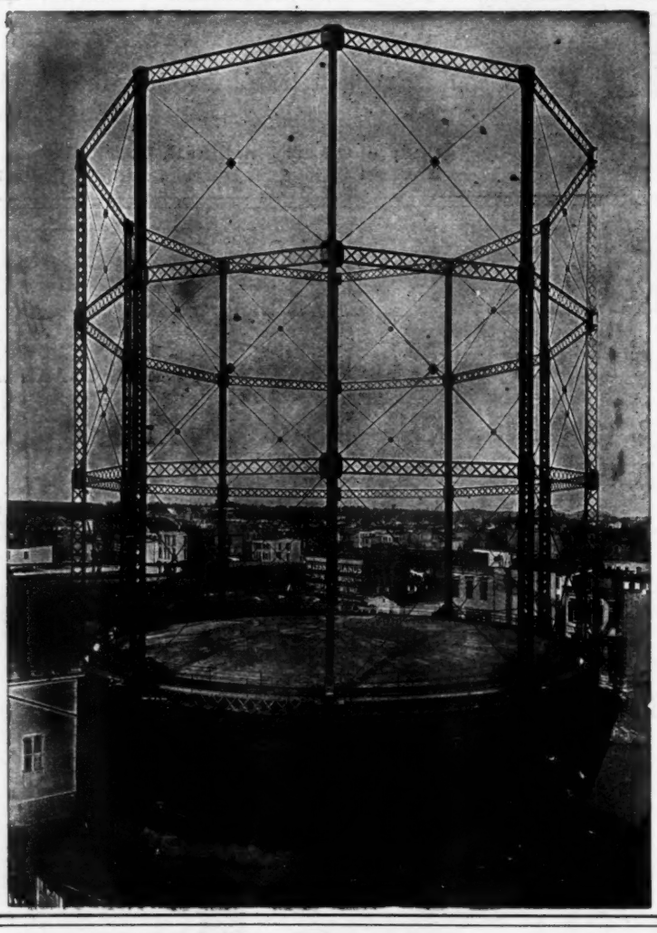

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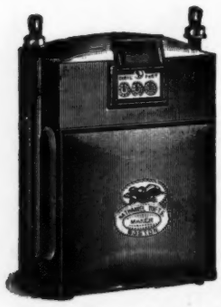

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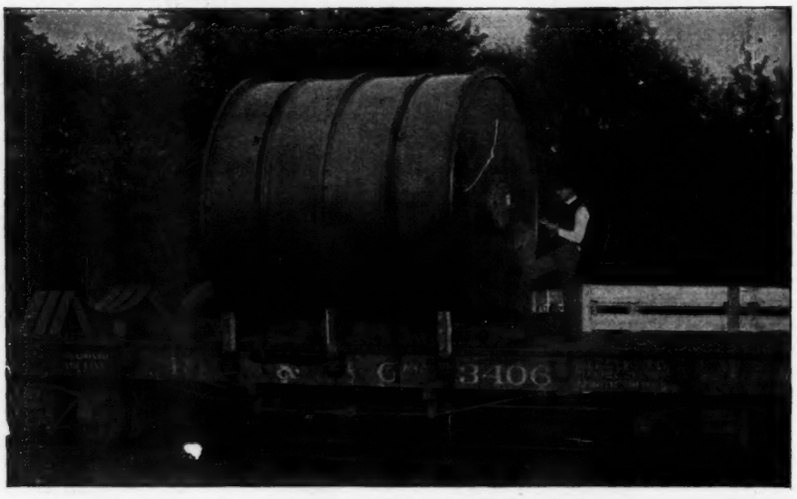

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